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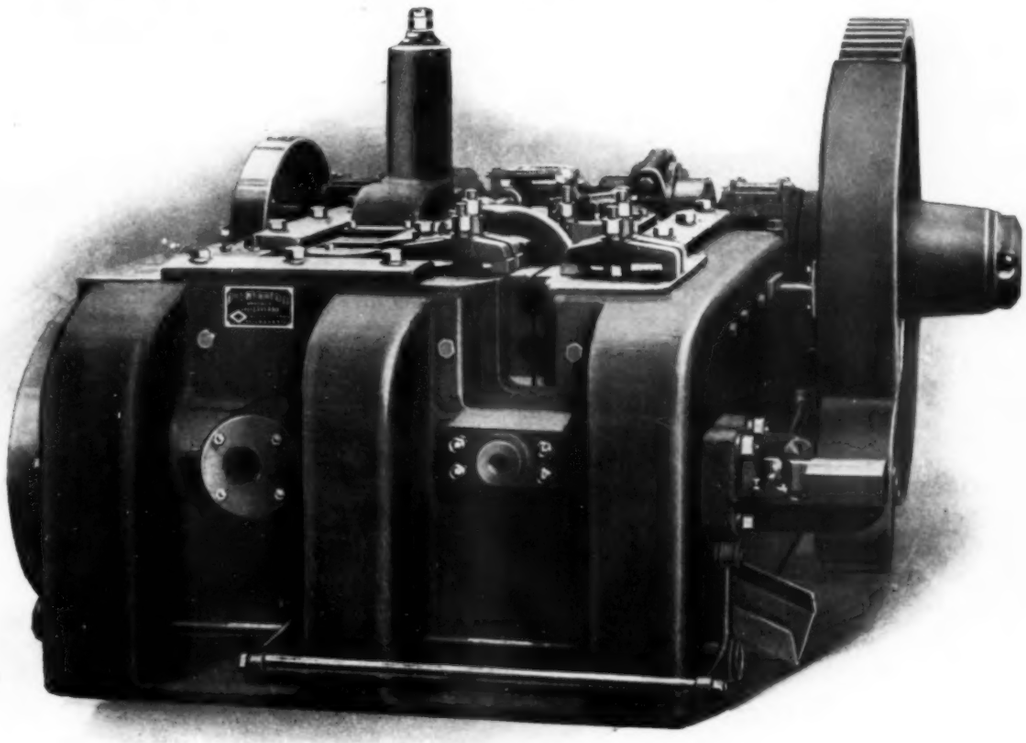

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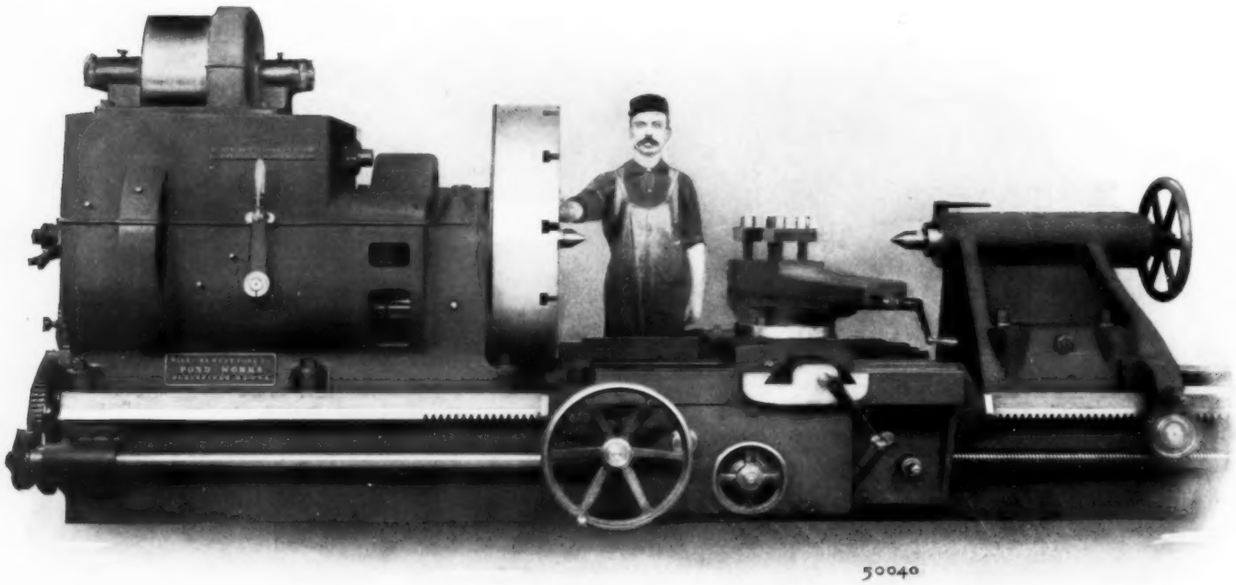

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(*See pages* 43, 44, 45, 46 and 47)

A Modern Bicycle Factory

By F. A. Stanley*

Operations in a factory turning out over five hundred bicycles every working day in the year. Methods of putting up frames; machining cranks, ball races and other parts; alining frames and front forks.

Many special tools and machines are required in the shop. How these are constructed and operated. Some points in pressing-up ball cups and crank hangers, with details of the sequence of operations necessary.

*Western editor.

There is a fairly common impression held by otherwise well informed individuals, that the bicycle is rapidly becoming an obsolete vehicle, and that comparatively few years will elapse ere it will be viewed more or less as a mechanical curiosity.

That this is a mistaken idea is easily demonstrated by a visit to the factory of the Davis Sewing Machine Company, Dayton, Ohio, where every working day of the year over 500 bicycles are completed and shipped to various parts of the United States and to different foreign countries. In fact, so important and substantial a part of the Davis company's business is this branch of manufacture, that the concern has recently erected a large concrete building to be devoted entirely to bicycle production; this in addition to several acres of floor space occupied for the same purpose in the older buildings of the plant.

Some features of the work carried on in this section of the Davis establishment should be of interest to readers of this journal, many of whom, especially among the younger mechanics, have had no opportunity of visiting a bicycle shop; while of the older men who examine this article, a good many will recall the period from 10 to 20 years back when bicycle factories were as numerous as automobile shops today.

Naturally, along with changes in machine manufacture in general, the methods of making and assembling bicycle parts have been much improved in recent years, and those conversant with the former processes in such establishments will find many new ideas and novel practices in vogue in the plant illustrated herewith.

Operations on Frames

The illustration selected for Fig. 1 has been chosen as representing in striking fashion the extent of the operations in frame manufacture. This view happens to be one of the departments where completed frames, painted and ready for the reception of front forks and wheels, are stored in wheeled racks and suspended from the ceiling until such time as they are required in the assembling room. There are probably not less than 5000 frames and forks in this room ready for withdrawal at any moment.

The tubing as it arrives at the shop is stored on the upper floor where it is cut to length for the various members of the frames and then passes to the frame-assembling department where tubes, lugs, hanger and head are put together, drilled and pinned ready for brazing, which is accomplished in the room shown in Fig. 2.

The spelter is heated in pots over natural-gas flame and the joints in most cases are brazed by dipping, as illustrated in Fig. 2. The filing shop is shown in Fig. 3 and here, as will be seen, the vises are each supplied with hinged wooden jaws that are cut out to suit the tubing and hold the frames without danger of mutilation.

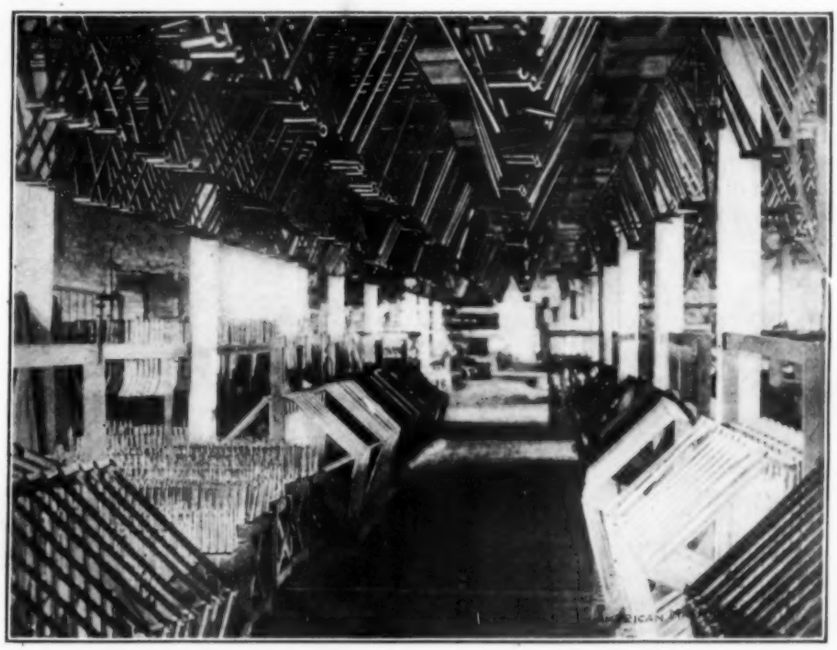


Fig. 1. Bicycle Frames in One of the Departments of the Davis Sewing Machine Company

Alining Tables

A handy alining table is shown in Fig. 4, as used in the department illustrated in Fig. 5. With the aid of this table and the gages used in conjunction with it, the frame is correctly alined, and when the wheels are later put in place no adjustment is necessary to cause them to "track" properly.

The alining table is really a heavy plate planed true on its face and mounted upon a central upright. It has near one edge a post *A*, upon which the crank hanger fits and to which the frame is secured by tightening the handwheel above the hanger. At *B* is a gage for testing the distance apart of the rear lugs, and at *C* a block in which a sliding cage is carried for determining if the lugs are equally spaced from the center line through the middle of the length of the crank hanger. The fixed block *D* is provided with a sliding plug which is adapted to enter the opening for the seat post, and the bar *E* is a testing device placed in the head and used in conjunction with hight gage *F* for determining the alinement of the head with the rest of the frame. Several other gages are applied in the process of alining the frame, and to make the construction and uses of the different gages clear, the sketches in Figs. 6 and 7 are referred to.

Gages Used in Frame Alining

Fig. 6 shows gage *B* to be a cylindrical plug with the ends milled off, leaving a tongue or tenon across the center of the end surface to pass into the slots of the rear lugs. The length of the plug over the shoulders is the distance required between the rear lugs, and if the forks are too far apart or too close together, they

are readily "set" to the desired position, as determined by the gage. At the same time the upper and lower rear forks have to be kept central with the crank hanger and this alinement is secured by testing with gage *C*. When the notched ends of the vertical plug in this gage slide freely into engagement with the slotted rear lugs, the lugs are obviously the correct distance apart and also are centrally spaced in relation to the crank hanger.

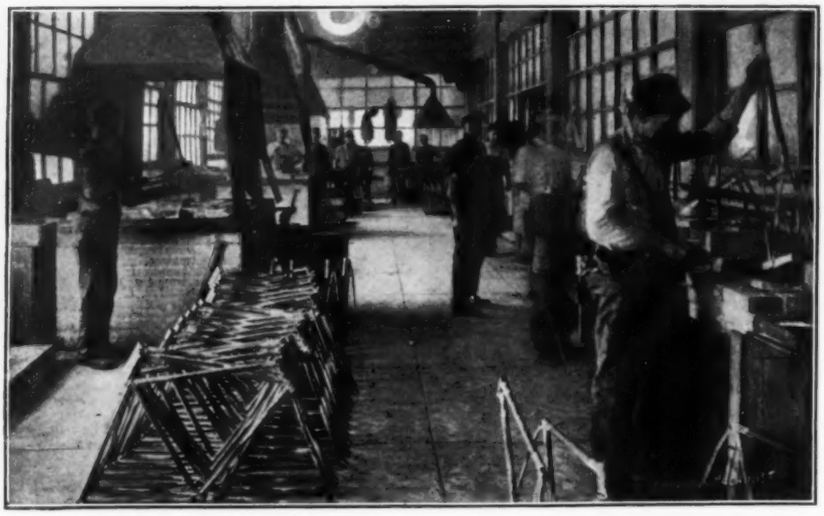


FIG. 2. BRAZING ROOM

During the "setting" or adjustment of the forks to bring the lugs into proper relation to each other, attention is also paid to truing the frame, so that the plug in bracket *D*, Fig. 4, will slide freely into the opening for the seat post; thus the alinement of the rear forks and of the vertical member of the frame is secured at the same time. The plug in head *D*, when slipped into the frame, supports the upper portion of the work rigidly and the frame may then be corrected at other points.

FIG. 3. FILING FRAMES

For example, it is necessary to aline the head carefully with the rest of the frame; the upper rear forks are required to be a given distance apart when tested at points near the upper and lower ends; and the lower rear forks are also to be kept a certain distance one from the other, as tested near the middle of the length; this in addition to the relationship maintained between the pairs of forks by the setting and gaging operations described already in connection with the rear lugs. Furthermore, the slots in these rear lugs have to be alined so that the edges will come in the same plane in order that the rear axle when slipped into place shall not throw the wheel out of a truly vertical position.

FURTHER GAGE DETAILS

The gage for the latter operation is seen at *G*, Figs. 4 and 6. It is really a square with a blade adapted to slide into the lug slots and into contact with either edge of the opening. If there is considerable departure from correct alinement of the two slots a bar is applied to the lugs to spring or set them closely to the desired position, then the lug at *D* is withdrawn and the entire frame is swung around against the vise *H*, which holds it securely while the workman dresses out the slots in the lugs with a file. The frame is then swung back, the plug *D* returned to its seat and the test gage *G* again applied. This operation is so readily performed with the aid of the special vise at the corner of the table that only a moment is lost in releasing the work, swinging it to the vise and back again to place.

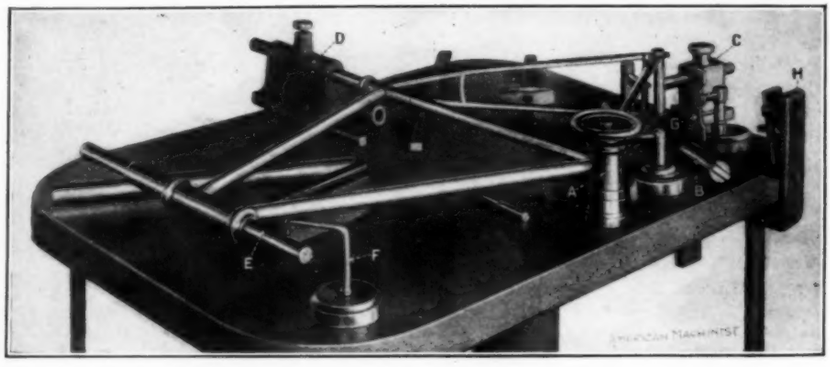


FIG. 4. BICYCLE FRAME ON THE ALINING TABLE

The spacing between the forks is gaged by tools like that shown in Fig. 7. This gage has two distance rods for testing at two different points in the length of the upper and lower rear forks. A similar gage with a single distance rod is applied to the outer ends of the forks near the lugs, and in Fig. 4 both gages will be noticed in contact with the work. If the tubular members are found to be too near together or too far apart at the point gaged, a light blow or two with a hammer and wood block, or easy pressure on a bar brings the forks into the desired relation to each other.

All these testing and correcting processes are carried along so rapidly that the whole frame is alined and out of the way before one can finish describing the method. Even the alining of the head is but a few seconds' work, for the trained operator. The test bar *E*, Fig. 4,

FIG. 5. FRAME-ALINING DEPARTMENT

is slipped into the head bearings and the hight gage *F* applied to each end of the bar. This gage is of such a hight that its point should just touch the upper surface of the bar at each end when the head is central and in alinement with the rest of the frame.

ALINING FRONT FORKS

For truing up front forks a bench fixture, Fig. 8 is used. This consists of a base with a head and pair of jaws for clamping the work by the neck at a definite hight above the base. Under the upper ends of the fork, near the crown, there is an adjustable T-shaped support *I*, and at the outer ends there is a squaring block *J*, which is tongued and guided by the slot in the surface of the base. A test pin is placed through the axle holes at the ends of the forks, and this pin must come in contact with both sides of block *J*, as shown in Fig. 9. It must also be at such a hight that the surface gage seen in Fig. 8 will touch the top of the pin when applied at either end.

The block *J* itself forms a gage for the width between fork ends and cannot enter between these ends unless they are a suitable distance apart and in alinement with the neck of the fork. The back face of the block is somewhat narrower than the face shown in contact with the work and the block can be reversed, if desired,

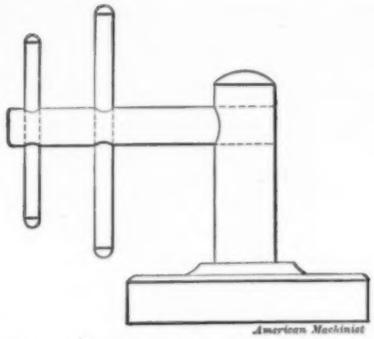


FIG. 7. ANOTHER GAGE FOR THE BICYCLE FRAME

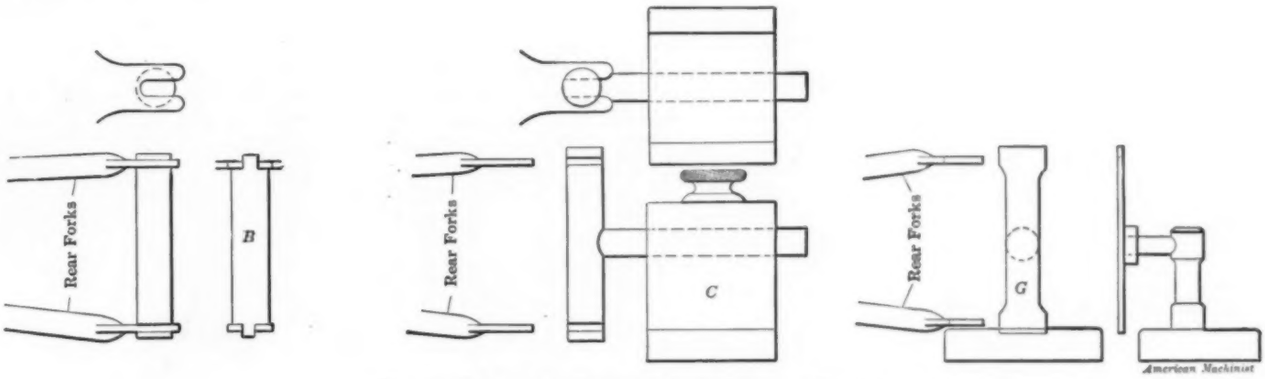


FIG. 6. GAGES FOR TESTING ALINEMENT OF FRAME

Of course, no frame ever goes on the table in which the head does not require some attention, but a short steel bar applied under one end of the test bar or over the other end, twists the head up or down as the case may be, and soon corrects the error.

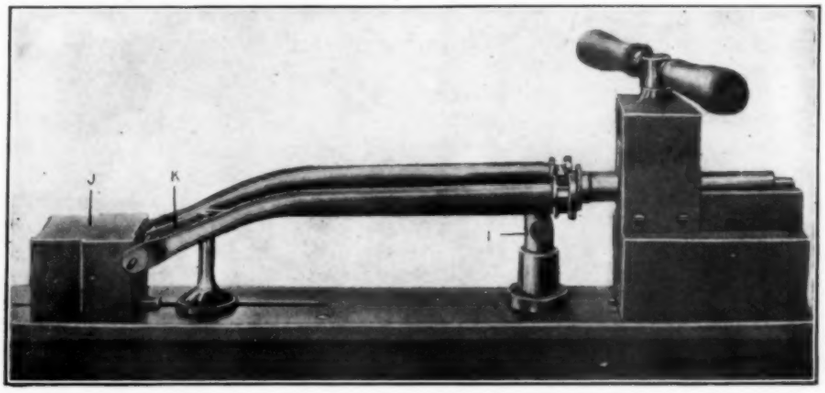


FIG. 8. FIXTURE FOR ALINING FRONT FORKS

to test more readily the parallelism of the pin (corresponding to the axle) with the base of the fixture and with the face of the block. When the pin touches both corners of the test block and is parallel with the base, as tested by the hight gage *K*, it is known that the front wheel can be put in place with the assurance that it will be correctly positioned in all respects.

A MULTIPLE-SPINDLE MACHINE

A special machine built in these shops for facilitating the handling of front forks, is illustrated by Fig. 10. This machine enables the upper end of the neck to be finished and threaded after brazing into the fork crown, so that danger of injuring the thread is obviated.

The machine has four spindles, though ordinarily only three of them, and often only two, are used. The work is gripped in a quick-acting vise, which may be traversed by handwheel and pinion and indexed under any of the spindles. The

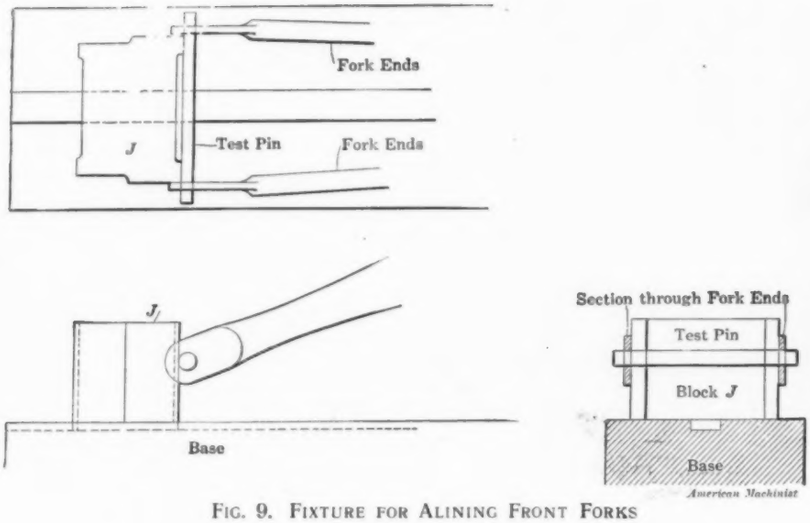


FIG. 9. FIXTURE FOR ALINING FRONT FORKS

machine is illustrated as set up with a reamer and facing cutter in one spindle for machining the mouth and end of the neck. The next spindle carries a hollow mill for turning the outside diameter for threading, and the third spindle is equipped with an opening die which cuts the thread.

The method of driving the spindles and the means of supplying lubricant to the tools and work are shown clearly.

MAKING ONE-PIECE CRANKS

Several models of wheels made by this company are equipped with one-piece cranks and some of the tools used in making these cranks are illustrated in Figs. 11, 12 and 13. The first of these views shows a drop die under the hammer for forging the cranks closely to finished form.

The material, a tough grade of steel, is cut roughly to length and after heating in a natural-gas forge, is drawn down under a helve hammer. The piece is then bent to the crank form on the die *A* at the left-hand side of the die block in Fig. 11, after which it is struck say four blows in the impression on the face of the drop die. It is next trimmed and then struck two or three more blows under the drop, following which it is trimmed again and the surplus metal at the ends cut off. The die illustrated will produce about 20,000 cranks before requiring replacing.

From the forge shop the cranks are taken to the machine room where the enlarged portions of the body between the cranks proper, are turned and threaded, and the ends of the cranks drilled, faced and tapped for the pedal pins. The turning operation is accomplished with the concave tools in the right- and left-hand blocks on the cross slide of the machine in Fig. 12. The cutters *B* and *C* are really hollow semi-circular shaving tools, each having one cutting edge and one edge serving as a rest and support for the work. The crank is driven by a slotted fixture on the spindle nose and is a very free fit in the slot, as the hollow cutting tools provide the necessary support for the crank as they are drawn together by the right- and left-hand screw.

The concave in the cutting tools is of a smaller radius than the work is finished to, so that at all times the forging rests upon the cutting edge of each tool and upon the supporting edge at the other side of the concave. The forgings are roughed down closely to size in one machine and finished with similar tools in another operation. In finishing, the operator closes the two cutters together until a graduation on the cross-slide collar tells him that the desired size is reached. The lever on the carriage is then operated to feed the tools to the left and face the shoulder for the sprocket. Upon opening the cutter blocks the crank may be slipped out in an instant, and if the machined surface is measured it will be

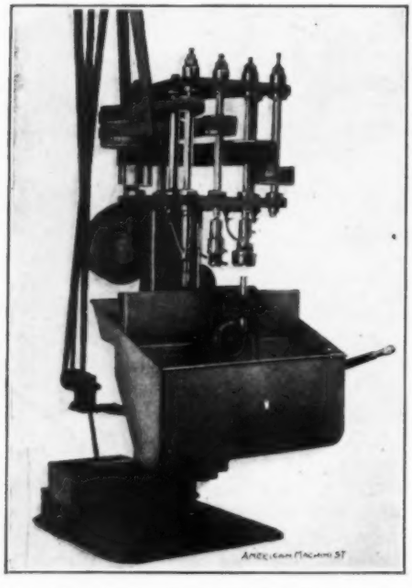


FIG. 10. MULTIPLE SPINDLE MACHINE FOR FINISHING FORK NECKS

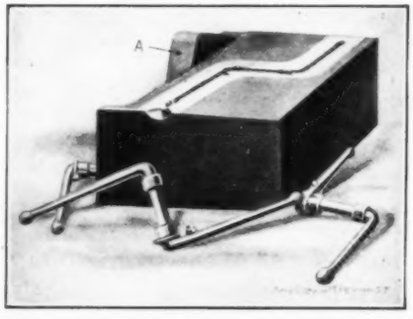


FIG. 11. CRANK DIE IN DROP HAMMER

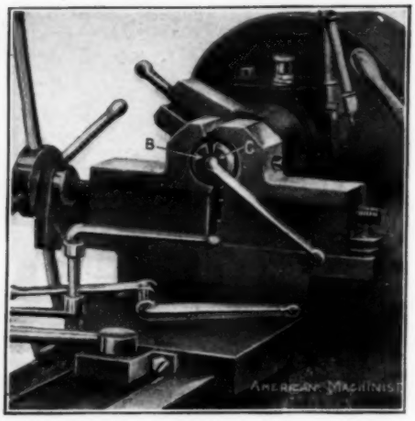


FIG. 12. FINISHING ONE-PIECE CRANK BODIES PRIOR TO THREADING

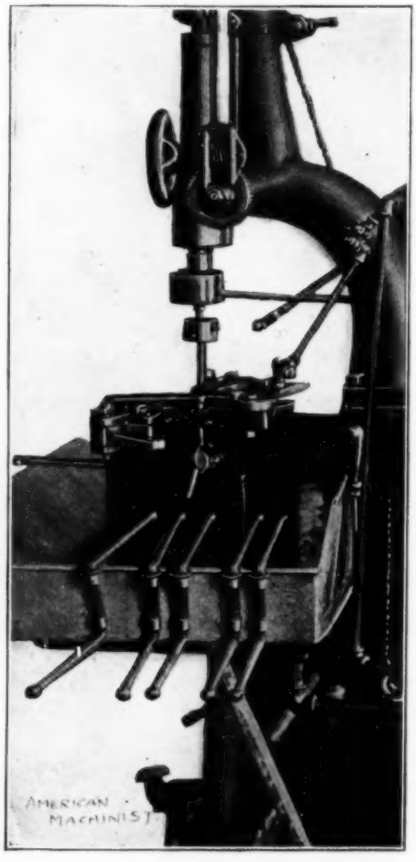


FIG. 13. DRILLING AND TAPPING CRANK ENDS FOR PEDAL PINS

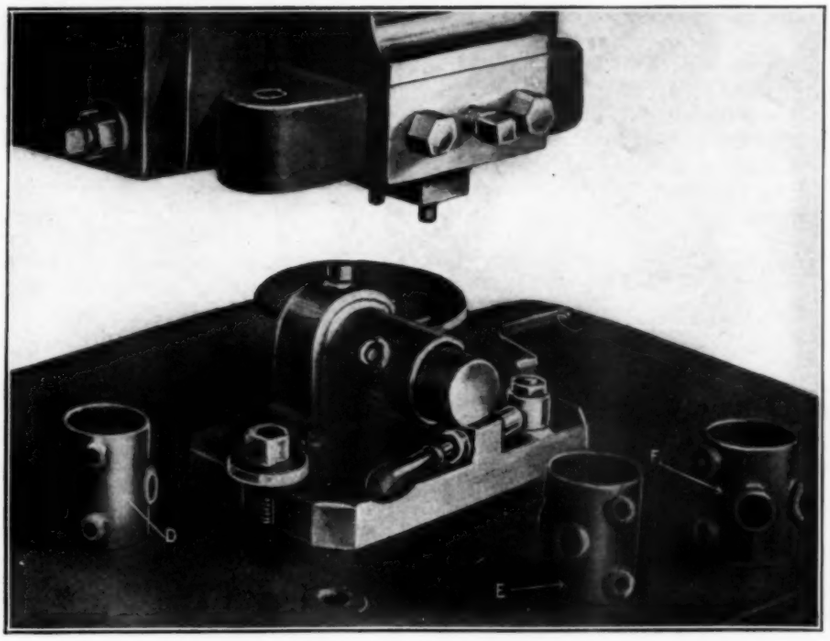


FIG. 14. OPERATIONS ON CRANK HANGERS

found to be round, straight, and to the exact diameter called for.

THREADING AND FINISHING CRANKS

The surfaces turned to size by the process described are threaded for the reception of the cones, by means of split dies arranged in blocks similar to the shaving cutters in Fig. 12. The forging is slipped into a driving fixture and the dies are closed over the reduced portion of the body by right- and left-hand screw in the blocks on the cross slide. The carriage is then operated to lead the dies onto that part of the work requiring to be threaded.

As one side of the crank is threaded right hand and the other left, one machine is kept in operation all the time cutting threads of one hand and a second machine utilized for the opposite thread.

Prior to the threading operation the ends of the cranks are drilled, faced and tapped, the machine for this work having four spindles as in Fig. 13. Here a fixture with an indexing holder is used, enabling the operator to turn the crank half way over in the vertical plane after one end is finished, to bring the opposite end into working position.

This fixture will be noticed near the end of the table. When the crank is placed in position it is secured by a quick-acting clamp acting upon the finished body, so that the piece is located by the machined surface. At the same moment a cam handle at the right is actuated to adjust a supporting plug into contact with the under side of the crank end. The support is hollow to admit the end of the drill and other tools which are controlled by a guide bushing in the customary fashion.

When one end is drilled, faced and tapped, the operator withdraws the support at the end, the gripping fixture is indexed half way round and locked again, and the support brought up to the second crank end.

The two outer spindles of the group of four are fitted with right- and left-hand taps. One of the intermediate spindles carries the drill and the other the counterboring tool for facing the surface around the hole. The jig is so constructed as to be readily slid from spindle to spindle for the three operations on each crank end.

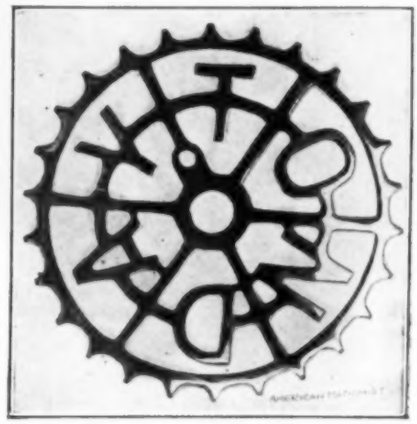


FIG. 15. "DAYTON" SPROCKET

MAKING CRANK HANGERS

The process of making crank hangers is indicated by Fig. 14 which represents several hangers in different stages of operation. In the first place the hanger blank is cut from steel tubing and then is taken to the press room where in the

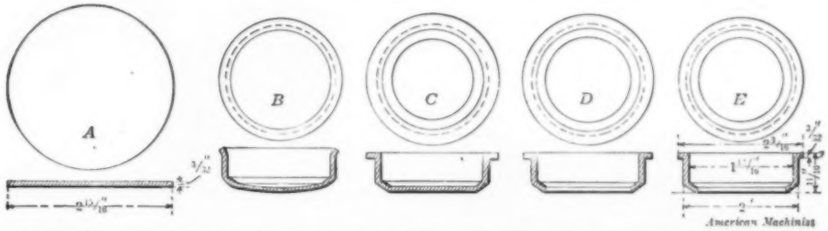


FIG. 16. SEQUENCE OF OPERATIONS IN MAKING A BALL CUP IN THE POWER PRESS

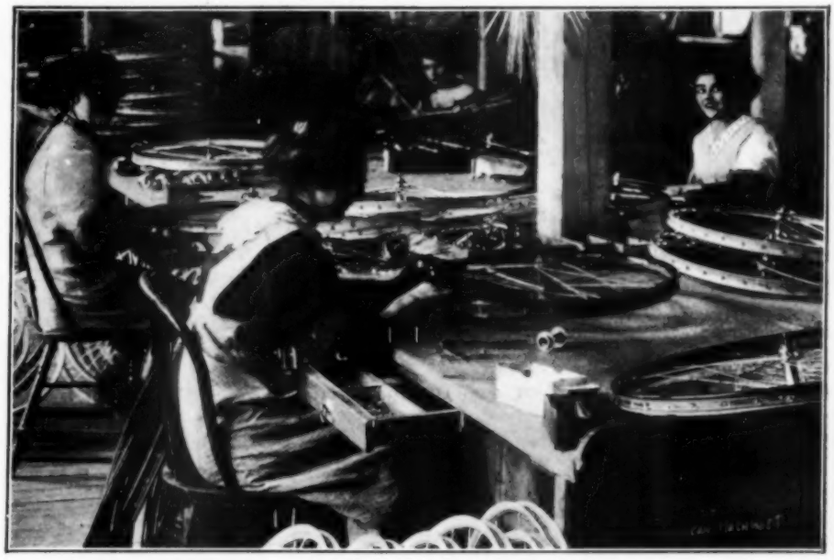


FIG. 17. LACING SPOKES IN WHEELS

first punch-press operation the lugs or projections are started as at *D*, the next operation punching the bottoms from these lugs as at *E*, and the following one drawing up the lugs to the required hight and diameter as shown at *F*.

The tools used are similar to those seen in the press in Fig. 14. The hanger is slipped onto a die in the form of a horn or arbor and the outer end is supported by a swinging shoe which is slid into place by operating the handle at the front of the die.

Another interesting power-press operation is the blanking out of the sprockets preparatory to cutting the teeth. These are made in various styles and sizes, and one which is used on the "Dayton" models is illustrated (completely finished) by Fig. 15, with the letters blanked midway between the arms of the wheel, the whole presenting a neat appearance.

FIG. 18. TRUING WHEELS

BALL RACES

Still another important branch of work carried on in the press department is the production of ball cups for crank hangers. These require five operations including the punching of the original blank, and the sequence is indicated by the sketch, Fig. 16. The cup blank *A* is punched 2 15/16 inches diameter from 3/32-inch stock and in drawing up the cup the first operation leaves the shell in the form shown at *B*, with the bottom bulging and the open end flared out liberally to facilitate the flanging in the third operation *C*. The spreading open of the mouth as at *B* allows the punch used with the third set of tools to force the metal out squarely into a seat in the die, and the result is a cup with a dead sharp corner inside the mouth and under the flange. At the same stroke the ball race is produced at the bottom of the cup, and the bottom surface flattened.

FIG. 20. OVER FIVE HUNDRED BICYCLES ARE SHIPPED FROM THIS DEPARTMENT EVERY WORKING DAY OF THE YEAR

The fourth operation consists in dropping the work into a simple receiving die where the opening is punched through the bottom of the cup, as shown at *D*. The final step is the cutting of the flange to size which is accomplished with plain trimming dies, leaving the cup in the form seen at *E*.

The cups are hardened and then polished on the inner surface. The ends of the crank hangers that receive them are counterbored out to a definite size and the cups are pressed nicely into place. Should there be any slight distortion in the cup due to the hardening process, the accurate seat onto which it is pressed would bring it to a true cylinder again.

ASSEMBLING WHEELS

Hubs, rims and spokes are put together in the department represented in Figs. 17 and 18. The spokes are laced through the hubs and rims by the girls at the bench in Fig. 17, who slip the nipples onto the threaded ends of the spokes and run them down to a certain position by means of automatic screwdrivers. These are power-driven devices with a screwdriver so arranged that when the operator pulls the nipple up against the driving tool it runs the nipple quickly down to a point where the spoke is fairly taut, and then releases itself automatically. With this machine the girl operator can thread the nipples onto the spokes for an entire wheel in a very few minutes' time.

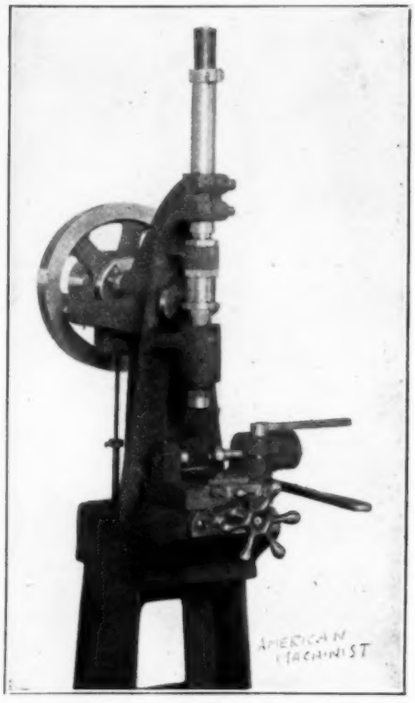


FIG. 19. RIVETING MACHINE FOR PEDALS

The actual tightening up, adjusting and truing of the wheel unit is attended to by the men at the bench in Fig. 18, who mount the wheels in convenient standards and set up the nipples by quick acting, hand-operated screwdrivers.

PEDAL RIVETER

One more special machine built in the factory is illustrated in Fig. 19, which shows a riveting machine for securing pedal frames. The work is removed in the view to show that the holding fixture is fitted with a pair of cones to receive the cups in the ends of the pedal barrel and

hold it level for the riveting over of the points on the pedal brackets which secure the side frames in place.

The method of operation and the character of the riveting tool are shown too clearly to require explanation in detail.

As a final illustration, Fig. 20 is presented, to show how bicycles are handled in quantities for shipment. The trucks hold ten wheels each and as fast as they arrive in the shipping department they are crated ready for packing in cars which are run alongside the factory. In the middle of the room will be noticed a chute suspended overhead which forms part of a system for shifting crated wheels from floor to floor. A similar chute leads down to the freight-car level and at a certain hour of the day the crates to the extent of five hundred or more, are shot down into the cars on the siding.

Designing the Geneva Stop

By E. Kwartz

Simple formulas for determining the proper number of slots to produce desired ratio of motion and dwell.

Examples worked out and directions given for drawing the parts in practice.

The Geneva stop is, of course, known in different forms to a great many readers of the AMERICAN MACHINIST. One of of these forms in which it usually appears on power presses and similar machinery, is shown in the illustration, and its action does not require much explaining.

It is shown in the position of driving roller E, leaving the slotted disk, or star wheel, after having turned the latter through part of one revolution; or in the position of entering the star wheel for driving, if direction of rotation is reversed. The round part $H K Q$, which may be cast in one with crank disk O, is in position to lock the star wheel, or driven member, until roller enters at G; or releasing it until roller leaves at G, depending upon direction of rotation. Part of the circle $H K Q$ is cut away at the left for clearing the arms of the star wheel.

The object of this article is to state some limitations of this movement and deduce some simple formulas for the benefit of the designer who may have occasion to use it.

Basis for Calculation

In using this movement, the designer may either determine the number of slots he wants in the star wheel, which will limit the relative time of operation and dwell of shaft A during one revolution of shaft B; or he may settle *approximately* the relation between operating time and locking time on shaft B, which will limit the number of slots in star wheel.

Let N = number of slots in star wheel. Examining the drawing it will be seen that angle $\triangle$ must always be 90 degrees in order that pin E may enter the slot properly, and

$$Angle\ \alpha = \frac{360}{N}. \qquad (1)$$

To anyone familiar with geometry, it also is plain that

$$\alpha + \beta = 180\ degrees;$$

from which

$$\beta = 180 - \alpha \qquad (2)$$

Again consulting the drawing, it may be seen that the smallest number of slots with which it would be possible to operate the star wheel would be three. The greatest number of slots possible depends upon the diameter of the star wheel and the size of the slots. If the slots could be considered infinitely narrow, their number may be infinite. Thus the theoretical limits for number of slots in the star wheel lie between 3 and infinity. Of course, the largest number possible in practice will not be very great, but the probabilities are that this limit will not often have to be reached.

Relation of Operating and Locking Periods

Now, suppose that the number of slots is determined, and one desires to find the relation between operating time and locking time during one revolution of shaft B. Angle β [see formula (2)] expresses operating time in degrees. If it is desired as a fraction of one revolution of shaft B, call this fraction Bt. Then, $Bt = \frac{\beta}{360}$, but from (2), $\beta = 180 - \alpha$; and from (1), $\alpha = \frac{360}{N}$.

Therefore,

$$Bt = \frac{180 - \frac{360}{N}}{360}.$$

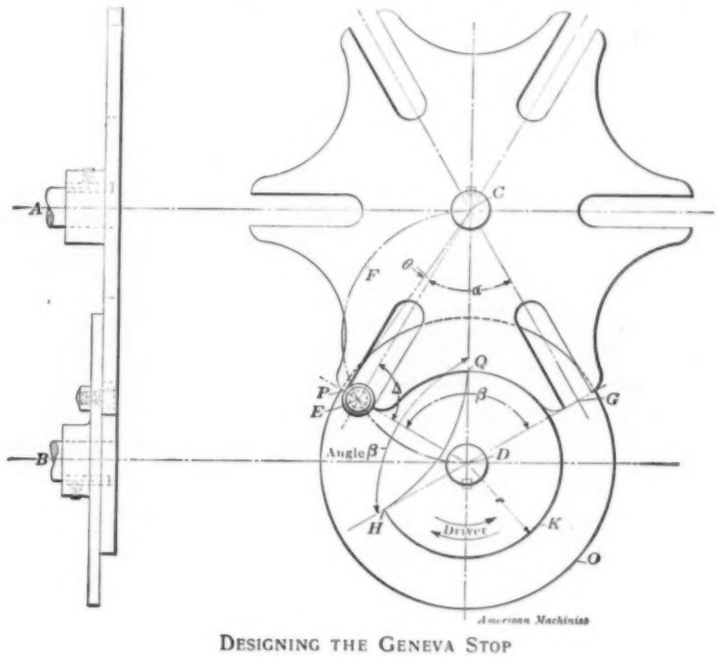
or

$$Bt = \frac{1}{2} - \frac{1}{N} \qquad (3)$$

From formula (3) we may obtain

$$N = \frac{1}{\frac{1}{2} - Bt} \qquad (4)$$

This formula will give N only approximately, unless the answer should be a whole number. As N is the number of slots, it can, of course, be only a whole number, and Bt eventually must be made to correspond.



DESIGNING THE GENEVA STOP

Examples

Assume, first, that number of slots N is determined; say $N = 6$. Then from formula (1), $\alpha = \frac{360}{6} = 60$ degrees. From formula (2), $\beta = 180 - 60 = 120$ degrees; and from formula (3), $Bt = \frac{1}{2}$

$-\frac{1}{6} = \frac{1}{3}$ revolution of shaft B, for operating time.

Next assume $N = 5$. Then $\alpha = \frac{360}{5} = 72$ degrees, and $\beta = 180 - 72 = 108$ degrees. Therefore, $Bt = \frac{1}{2} - \frac{1}{5} = 0.3$ revolution of shaft B.

Now, changing the conditions, assume $Bt = \frac{1}{4}$; that is, $\frac{1}{4}$ turn of shaft B is desired to operate the star wheel. Then, from formula (4), $N = \frac{1}{\frac{1}{2} - \frac{1}{4}} = 4$ slots required in the star wheel. It would seem logical that four slots would give $\frac{1}{4}$ operating time, but this does not hold for all fractions, as the next example will show.

Assume $Bt = \frac{1}{5}$. Then from formula (4), $N = \frac{1}{\frac{1}{2} - \frac{1}{5}} = \frac{10}{3} = 3\frac{1}{3}$; but, as N can be only a whole number, we will have to be satisfied with either three or four slots in star wheel and take B what it comes for this number.

Laying Out the Wheels

In most cases where this device would be used, one probably would start out by deciding upon a certain center distance, if this is not already fixed; then construct a semicircle $DEFC$ upon this center distance and lay out an angle $DCE = \frac{\alpha}{2}$. Connect DE and draw line GD, extending it toward H, which will make an angle $QDH = \beta$, limiting the ends of clearance cut QH of the locking circle.

Radius r of the locking circle is somewhat a matter of choice. As a standard, I would suggest taking nearest sixteenth of an inch to result obtained from expression: $r = DE - 1\frac{1}{8}d$; d being the diameter of driving roller. The shape of the clearance cut is found by tracing one arm of star wheel on one piece of tracing cloth and the crank-pin roller, center of crank disk and circle HKQ on another piece of tracing cloth; fasten these pieces with pins to the drawing board with their proper center distance, placing the crank pin tracing on top, and rotate together, tracing the arm of the starwheel in different positions on crank disk tracing while turning over center D. Draw a curve QH that will clear these marks. The curve may be cast with a considerable clearance, but the end points H and Q should be located properly on legs of angle β, as described.

Extreme Radius of Star Wheel

Distance DE = radius of crank circle $= DC \sin. \frac{\alpha}{2}$. To find extreme radius of star wheel make an accurate layout as stated, and scale distance CP; or calculate thus: $CE = DC \cos. \frac{\alpha}{2}$. Assume diameter of driving roller $= d$. Then,

$$CP = \sqrt{\left(\frac{d}{2}\right)^2 + (CE)^2}.$$

If an accurate layout is made, the calculating of CP is not necessary.

It will be seen from the illustration that the number of slots may not be very much less than 6 before crank disk O would interfere with the hub of the star wheel. When such becomes the case, the crank disk would have to be placed on opposite side of the star wheel.

A crank is sometimes used to carry the driving roller, instead of disk O, but in my opinion is not as neat and is certainly more dangerous, as I know of a mechanical superintendent who had one of his finger tips cut off by one of these cranks coming around at an unexpected moment.

Test Fixture for Gasoline Motor

By Stanley W. Mills

The accompanying drawing is of a fixture used for testing cams, which I believe will be of interest to American Machinist readers.

A sample cam is shown at Fig. 1, and is of the type keyed and pinned to the cam shaft. The hole and working surfaces AA are ground, and extreme accuracy is required in timing. After milling and hardening, the hole is ground and then the working surfaces in a special fixture.

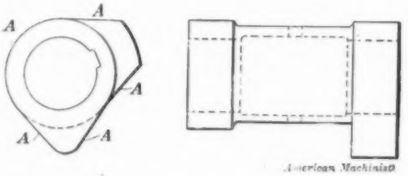


Fig. 1. Cam to be Tested

An assembly of the test fixture is shown at Fig. 2, and consists of a cast-iron base A and pilot B ground to same diameter as cam shaft and fitted with a key to locate the cam. Swiveling on pilot B is an arm C carrying a block D into which is pressed a stock cam slide bushing, exactly as fitted to motor.

Attached to upper end of cam slide is an arm E operating a tell-tale needle F by means of screw G pivoted at H. A coil spring J keeps roll K in contact with the cam being tested, and on turning arm C, any movement of roll K is communicated to needle F, and indicated at L in thousandths.

Allowable clearance between valve stem and tappet is 0.002 and, by means of adjusting nuts $M.M$, a space equal to this can be obtained between nuts and arm E, thus duplicating actual working conditions in the motor.

Base A is graduated to read to $\frac{1}{4}$ of a degree, corresponding to $\frac{1}{2}$ degree on motor crank shaft. With these graduations and by noting the movement of needle, the exact moment when valve begins to open can be detected.

With cam slide adjustable by means of nut N, the necessity of holding concentric portion of cam to any particular size is obviated as, providing angle O is maintained, the valve opening remains constant.

The principal object aimed at was to duplicate working conditions in the motor, and this fixture approximates more nearly to this than any I have yet met with.

To prevent glue cracking add a little chloride of calcium, which will absorb enough moisture to counteract excessive dryness of the glue.

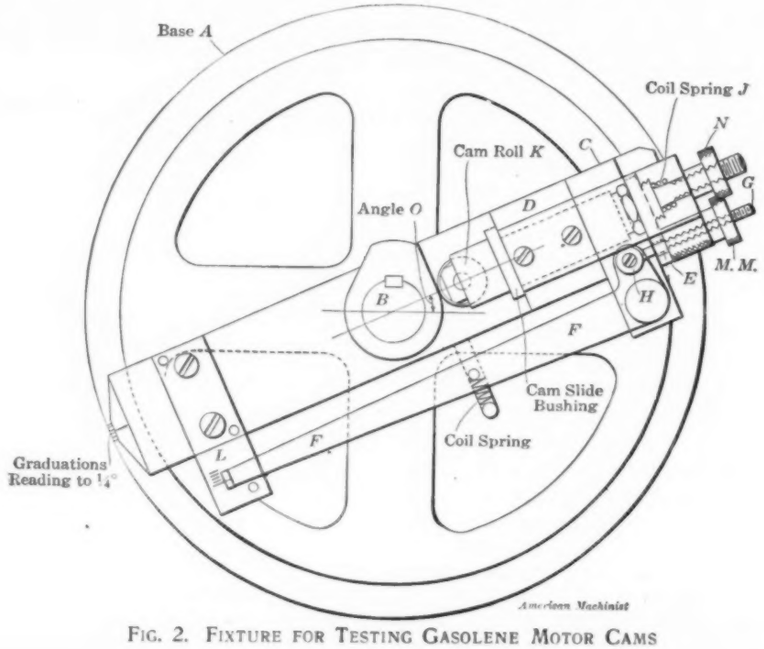


Fig. 2. Fixture for Testing Gasolene Motor Cams

Shop Methods of an Elevator Company

By Ethan Viall*

Details of a notching press indexing mechanism. An air blowing attachment for a boring bar and some babbitt rolling tools. A spiral grinding fixture and a few interesting milling and drilling jigs.

*Associate editor.

Few shops of any kind have more interesting mechanical features and tools than the A. B. See Electric Elevator Company, Jersey City, N. J., and through the courtesy of Superintendent Lindstrom, we are here enabled to describe a number of them.

Indexing mechanisms are always interesting and Figs. 1 and 2 illustrate some changes that have been made in an E. W. Bliss notching press. The disk to be notched is held at *A* by means of the modified toggle clamp *B* on the overhanging arm *C*, all of which is a part of the original press equipment. The indexing plate *D* is operated by the rocker arm *E*, through the rod *F* and the dog *G* on the lever *H*. As the plate *D* is fed in the direction indicated by the arrow, spring *I* forces lever *J* forward until a tooth on the opposite end of it drops into one of the indexing notches in the periphery, securely locking it in position during the stroke of the press ram carrying the notching punch. When the press ram rises the rocker arm *E* forces the rod *F* forward and the collar *K* carries the end of *J* forward, which withdraws the locking tooth from the notch in the indexing plate. This collar *K* is set on the rod *F* so that the lever *J* cannot go forward far enough, as the rod *F* starts back, to enter a notch until the index plate has fed along a short distance, when the locking tooth slides along the rim of the plate as it rotates, until the spring *I* snaps it into the next notch and locks the plate for the next stroke of the punch.

The tripping device is shown in the second halftone; *L* is the rod from the foot lever and *M* the one leading to the clutch. As the foot lever is pressed down to start the press, the point of dog *N* is raised, allowing the spring *O* to pull the rod and block *P* back, which prevents the dog *N* from dropping back and letting the clutch release, consequently the press continues to work until a knock-out pin on the underside of the index plate makes a complete circuit and, coming in contact with stop *R*, pushes the rod forward far enough for the dog to drop down, letting the rod *M* rise and throw out the clutch, which stops the press and allows the finished disk to be removed and another blank put in place.

Fig. 3 shows a Gisholt boring tool fitted with a pneumatic chip blower, which also serves to cool the tool. The air is conducted from the hose *A* through a hole in the center of the boring bar and blown over the ends of the cutters through two small tubes more clearly shown in Fig. 4.

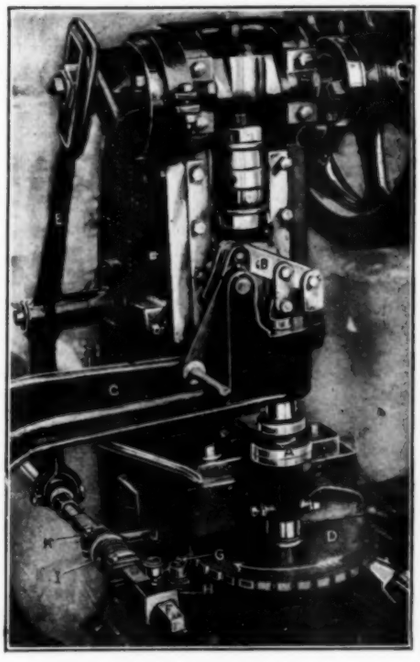


FIG. 1. NOTCHING PRESS-INDEXING DEVICE

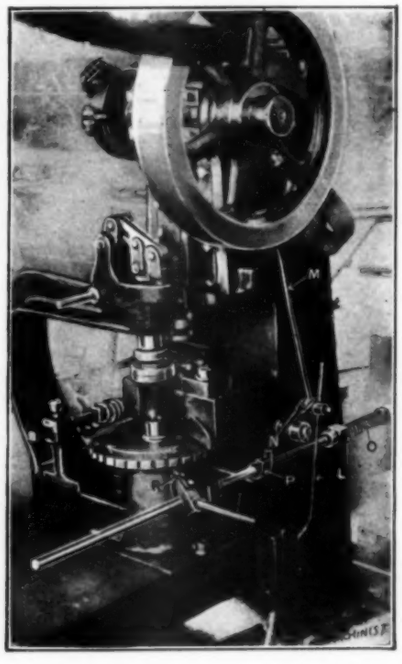


FIG. 2. THE TRIPPING MECHANISM

ROLLING BABBITTED BOXES

A great many babbitted bearings are used in elevator construction, and this company, after casting the babbitt with the hole small, uses an expanding roller tool to compress and force the babbitt solidly into the box before reaming, which gives a firm bearing that does not need to be touched with a hand scraper.

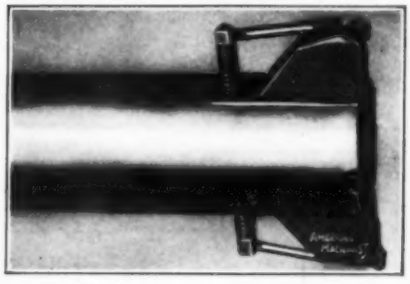


FIG. 4. END OF BORING TOOL, SHOWING AIR NOZZLES

The upper illustrations, Fig. 5, show two of the expanders used on large

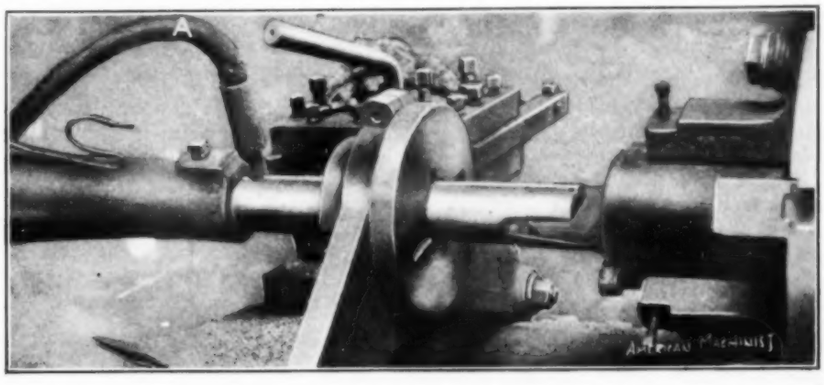


FIG. 3. BLOWER FITTED TO A GISHOLT LATHE TOOL

bearings, parts *A A* being threaded on the ends, which fit into nuts in the ends of the frames or cages, the other ends which come into contact with the inner surfaces of the rollers being tapered, so that when one of these expanders is placed in a babbitted box and the taper plug screwed in until the rollers are in contact with the babbitt, further turning of the plug not only gradually expands the roughing tool allowed to cut, which is followed by the finishing tool; the entire job being completed at one pass.

An Attachment for Grinding Spirals

Spiral fluted cutters are ground on an ordinary grinder, using the attachment shown in Fig. 6. A fine-toothed rack *A* is bolted to the back of the table bed. Over this rack runs the gear *B*, the

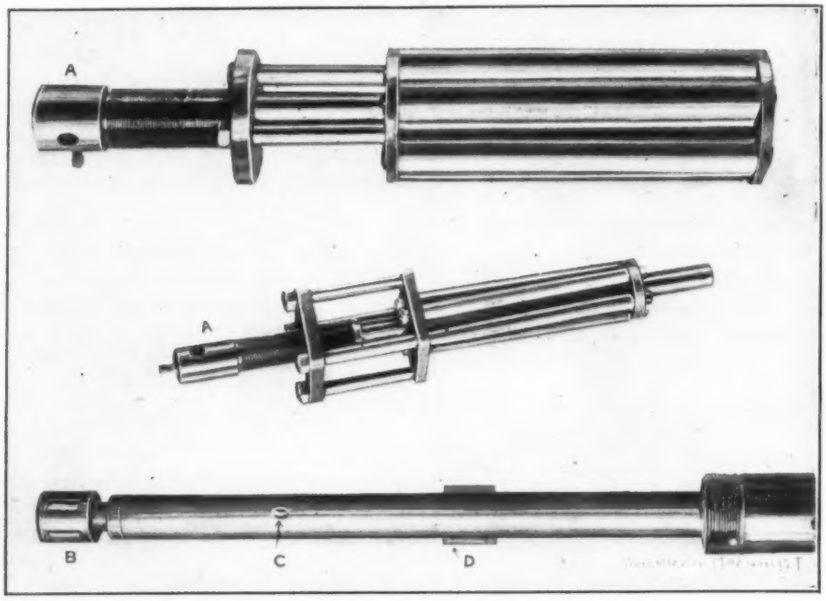


Fig. 5. Babbitt Bearing Rolling and Boring Tools

halves of a cast-iron pulley as, if the hole is roughed out and finished after the parts are bolted together, it is very apt to run one way or the other, unless more care is taken than the job usually warrants. The method used by Superintendent Lindstrom is to first machine off the flat surface, either by planing or milling, and then using this flat surface and the round part of the hub to locate by, clamp them in the milling jig, shown at *A* and *B*, Fig. 7, and mill out the half of the shaft hole in each casting with a half-round mill of the proper size, after which the parts are drilled and bolted

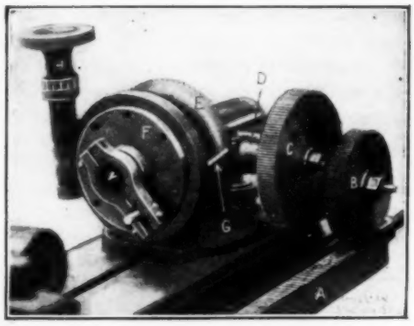


Fig. 6. Spiral Cutter Grinding Head

together and then finished with a hand reamer.

Referring to the part of the milling jig shown at *A*; *C* is a jack clamp used to force the hub of the casting up, so

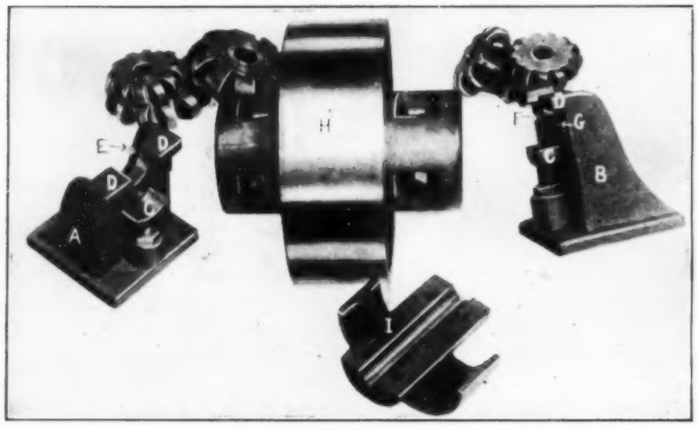


Fig. 7. Split-pulley Milling Jig and Cutters

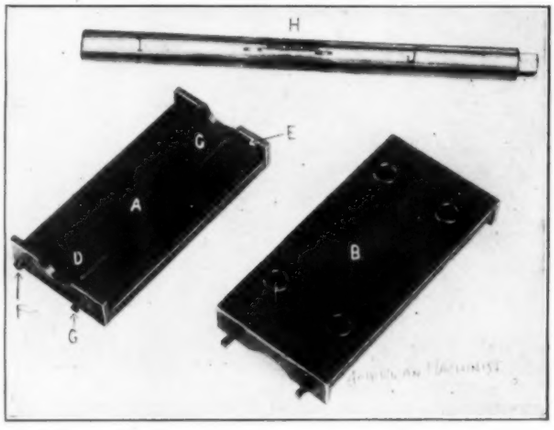


Fig. 8. Split-pulley Reamer and Drilling Jigs

the set of rollers, but also makes them rotate and travel around the interior of the box, rolling out and hardening the babbitt.

The lower tool in this halftone rolls, rough bores and finishes small boxes. *B* is the cage and rolls; *C* the roughing and *D* the finishing tool, and in using this tool the rolls are placed in the bearing and the taper end of the face gradually forced in as the box is rotated, and as the cage comes in contact with the shoulder of the taper the rolls are fed out at the other end of the box and

Milling Shaft Holes in Split Pulleys

It is often difficult to get the shaft hole equally divided between the two hub pinion of which meshes with gear *C*, which drives bevel pinion *D* and rotates the face plate *E*, by means of the bevel gear *F*, an amount depending on the gearing used and the length of table traverse. The face plate shown has eight index holes in it, a pin being located at *G*. Part *H* is used to turn the face plate for feeding purposes as the work is ground.

that the machined surface comes in contact with the under side of the projecting parts *D D*. After the casting has been placed in position between the parts of the jig *A* and *B*, which, of course, are bolted to the miller table, it is kept from any tendency to move during the milling operation by setscrews which butt against the ends, and are shown at *E*, *F* and *G*.

A finished pulley is shown at *H* and a finished half at *I*, the bolt holes being drilled by the use of the jigs shown in Fig. 8. *A* shows the bottom of the jig

and *B* the top, the jig being located on the half pulley by means of the two pieces *C* and *D*, which fit the shaft hole. The proper distance from the end of the hub is given by the stop *E*, and the jig is locked in place by the two setscrews *F* and *G*. After being drilled the two halves are bolted together and hand reamed as previously stated, one of the reamers being shown at *H*, the pilot *I* being the size of the rough and *J* the size of the finished hole. When the shaft hole has been finished the pulley is placed on a mandrel and the face turned and crowned.

C and *D*, the castings are bored out. The piece *E* is made to wedge in between the two castings and give them more stability during the operations.

Fig. 10 shows an unusual type of bucket oil ring used on slowly revolving shafts. At first these rings were made so as to be taken apart and slipped over the shaft while in place, but as they practically never wear out, they are now made of one solid ring casting with cells in it, to the side of which a ring is riveted to form the buckets, as shown at *A*.

Fig. 11 is an angle bender, the iron being clamped in a vise at *A*, and bent

milling operations of any kind where the work would ordinarily be held in a plain vise or some form of V-block.

There are several such fixtures of various sizes in regular use in the shop, the one illustrated having a length of about 14 inches over the working portion or body proper. There are two openings the full length, one side of the cut being vertical, the other having a slope of about 60 degrees which holds the piece down when it is pressed against the undercut by the set screws through the side of the fixture.

Each slot or channel will receive a number of different diameters of stock

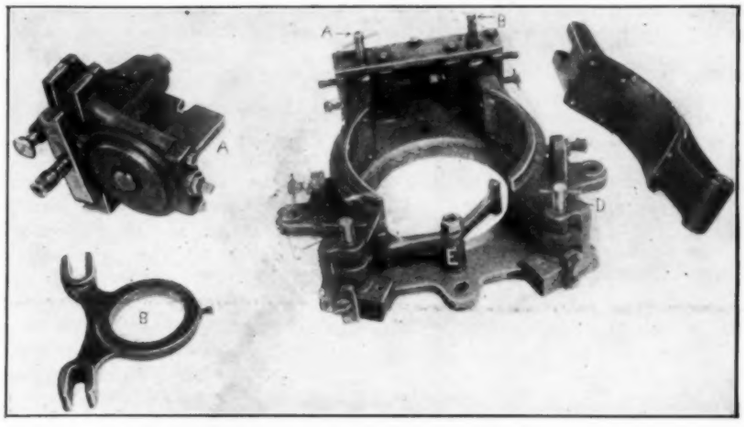


FIG. 9. A JIG FOR MILLING ROCKER ARMS AND ONE FOR BORING BRAKE SHOES

FIG. 10. CELLULAR OILING RINGS

At *A*, Fig. 9, is an indexing jig used for milling out the fork ends on the rocker arm *B*, the construction and action of which is so apparent that no explanation need be given.

A DRILLING AND BORING JIG

At *B* is a combination brake-shoe drilling and boring jig. The brake-shoe

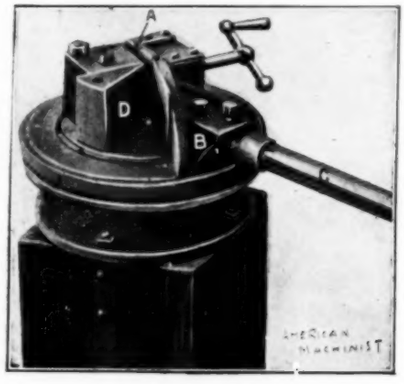


FIG. 11. AN ANGLE BENDER

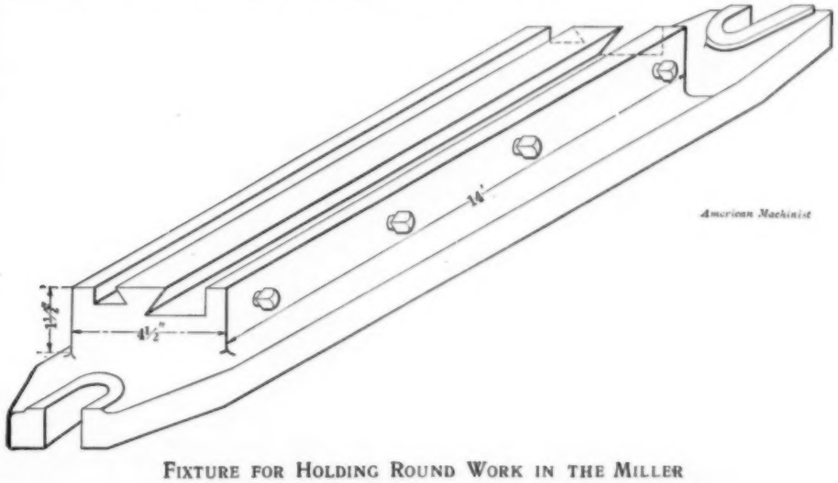
castings are first put into this jig, two at a time, and while held by setscrews the end holes are drilled; then after a lot of castings have been drilled, the jig is either bolted to the faceplate of a lathe or the table of a boring mill and then, using pins in the drill bushings at *A*, *B*, by pulling around part *B* by means of handle *C*, various angles being bent by slipping different angle forms in place at *D*.

Fixture for Holding Round Work in the Miller

One of the convenient special devices in use at the Carroll-Jamieson Machine Tool Company's shop at Batavia, Ohio, is the milling-machine fixture shown in the accompanying sketch, this being designed for holding shafts, screws and other cylindrical parts requiring keyseating, or and pieces of any length can be held satisfactorily. While four screws are shown in the fixture illustrated, the number is varied to suit the length of the fixture.

The smaller of the two openings in this fixture takes work from ½ to ⅝ inch diameters; the larger from ¾ to 1 3/16 inch.

The Capt. John Ericsson Society of Swedish Engineers is now located in the United Engineering building, 29 West Thirty-ninth street, New York. This society was organized in 1907.



FIXTURE FOR HOLDING ROUND WORK IN THE MILLER

Work Routing and Controlling System

Editorial Correspondence

A simple, effective system, in use at the works of The Bullard Machine Tool Company, that furnishes accurate and immediate informatian in regard to all work going through the shop. From this information the work is scheduled so the machines will be finished on specified dates.

The result of installing this system has been a material increase in shop production.

Some 18 months ago the Bullard Machine Tool Company, of Bridgeport, Conn., installed a work-routing and controlling system. After the modifications and developments that are inevitable in perfecting anything of this kind, the system stands today as a simple, effective method for furnishing accurate and immediate information in regard to the work going through the shop, and thereby gives a basis for an intelligent control of production.

The result of installing this system has been a material increase in production. Prior to its development, the ability to produce small parts, such as feed works, driving units, etc., was not equal to the erecting capacity. The erecting department was always ahead of the rest of the shop and waiting for work.

Shortly after the system was adopted the erecting facilities were increased by adding a new crane section at the west end of the plant. This addition was necessitated by the fact that the manufacturing departments were then able to produce small parts in excess of the capacity of the erecting department to finish machines. Notwithstanding this increase in erecting space, small parts are still produced in excess of the needs of the erecting facilities and any further addition to the plant will undoubtedly be for erecting purposes.

From the above it naturally follows that the capacity for total output has materially increased and thus the output limit under the routing and controlling system is much larger than before.

Permanent Records and Charts

The permanent written and plotted records used solely for this work of routing and controlling consist of two files of cards and two sets of charts. One card file is for the master cards, the other for the operation cards. One series of charts gives the departmental capacity and progress of jobs for each shop department; the other series gives the progress of each job, both completed and uncompleted, from the time of installing the system.

Other shop records are used as a source of information, but all of these were in use in their present form prior to the adopting of the methods being described.

As a temporary record, a letter is sent to each department foreman every Monday morning scheduling the work to be done in his department during that week.

The net addition in number of clerical help because of this system has been one. A production engineer devotes most of his time to this work, and a clerk all of his time to the card files. A shop tracer formerly employed has been dispensed with.

How the Records Are Compiled

All production orders issue from the office of the president for a lot of a certain number, size and kind of machine; as, for instance, fifty (50) 24-inch vertical turret lathes. This order is transmitted to the order clerk, who has charge of the records of raw material on hand and on order, who at once places orders for whatever additional raw material may be necessary to complete the lot of machines. At the same time he fills in part of the data on the master card of the routing and controlling system.

A specimen master card is shown by Figs. 1 and 2, front and back, respectively. The heading of this card calls for the name of the piece, the assembly division or assembly unit on the machine, its number, the drawing number giving its details, the material from which it is made and the number of pieces per machine. Below this heading are four vertical columns, each one for a single lot or order number. Thus, this master card serves for four successive lots of machines. In Fig. 1 three lot numbers are shown, 147, 168 and 205, with the fourth column blank for the next order. The data in these columns concern raw material. The first four items are filled in by the order clerk when he places the outside order. The fifth line, "date due," is filled in, depending upon the need of the shop, and the information upon which it is based comes from the department charts that will be described later in this article.

NAME Spiral Gear Blk Bush DIVISION **HEADSTOCK** PIECE No. 4550
DWG. No. 12740 MATERIAL C.S. STYLE No.
No. PER MACHINE 2

JOBS	147	168	205	
ORDERED FROM	B.F.D.	B.F.D.	B.F.D.	
ORDER No.	23219	248	2101	
No. ORDERED	100	100	100	
DATE ORDERED	3/26	4/25-10	3/10	
DATE DUE			3/15	
DATE and No. RECEIVED	3/14 105	5/8 42	3/14. 34 3/13. 8 3/22. 39 3/23 7 3/23. 42 3/25-19	

REMARKS 48 on hand after 168

Fig. 1. Form of Master Card—Front

STD ROUTE	STD TIME	JOB 147 IN	OUT	S.T.	A.T.	JOB 168 IN	OUT	S.T.	A.T.	JOB 205 IN	OUT	S.T.	A.T.	JOB IN	OUT	S.T.	A.T.
Planing		3/10	3/26			3/8	3/8			3/24	3/30						
Milling & Fit	071	3/26	3/26							3/29	3/29						
Turning	3	3/28	3/4			3/13	3/14			3/31	4/5						
Grinding	1	3/4	3/8			3/14	3/15			4/5	4/6						
Slotting	025	3/8	3/8			3/15	3/16			4/6	4/10						
Assembly																	

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Fig. 2. Form of Master Card—Back

The line, "date and number received," is filled in by the order clerk from a copy of the receiving clerk's daily report. This report is in the form indicated by Fig. 3.

Coincident with the filling in of the first four items on the master card by the order clerk, he writes a corresponding work tag, see Fig. 4. If the rough stock corresponding with this tag is in the store room, the tag is immediately passed to the clerk who cares for the master- and operation-card files. In case the rough stock is not on hand the tag is filed by the order clerk until it is re-

ceived; the tag then goes to the card clerk, as indicated above.

A specimen operation card is shown by Fig. 5. There is one such card for each operation on every piece manufactured. These cards are used over and over again as successive lots are made by merely canceling the previous lot number and writing in the number of the lot in process. Thus, these cards can be used an indefinitely large number of times.

As soon as the card clerk receives the work tag from the order clerk, he selects the operation card for the first operation on the piece called for, and sends both work tag and operation card to the foreman of the department where the operation is to be done. At the same time he records the date on the back of the corresponding master card, see Fig. 2. It will be noticed that the column at the left gives the standard route for the part in question from department to department. The next column is for the standard time in hours for performing each operation. The rest of the card is divided into four series of vertical columns, one for each of the job numbers corresponding with the job numbers on the face of the card.

When the card clerk sends the work tag and its corresponding operation tag to the shop foreman, he records the date in the "in" column for the job number in question.

After the operation has been finished and the work inspected, the operation card is returned to the card clerk, indicating that the operation has been finished and that the boss helper has been notified to transfer the work to the department which is to do the next operation. It will be noted that the sequence of operations is given on the front of the work tag, Fig. 4. When the card clerk receives the returned operation card, he immediately picks out the card for the next operation and forwards it to the proper department foreman. This indicates to him that that particular lot of

Date April 18 191

Received From A.B Foundary

Order No.	Pattern No.	Pcs.	Job No.		Weight	Price
2533	924 ac	8	205	568		
2264	242 ac	2	"	97		
2648	703 ac	11	"	352		
"	502 ac	9	"	190		
"	505 ac	15	"	140		
2695	405 ac	3	"	47		
					1394	

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FIG. 3. FORM OF RECEIVING CLERK'S REPORT

HEADSTOCK.

Std. Time 3 Hours Div.

Name Spiral Gear Bkt. Bush. No. 4550

Operation Turning to grind, square ends & round corners.

Job No. 168 205

American Machinist

FIG. 5. FORM FOR OPERATION CARD

THE B. M. T. CO. ORDER DEPT. MATERIAL

Job 168 No. Pieces Required 100

Division HEADSTOCK.

Name Spiral Gear Bkt. Bush.

Piece No. 4550 Hole

Style No. A. B.

Drawing No. 12740 For Dept.

Size

NO. FIN.	OPERATIONS	O. K.
	CLEANING.	
	CHUCKING.	
	TURNING.	
	GRINDING.	
	SLOTTING.	
	ASSEMBLING.	

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FIG. 4. FORM OF WORK TAG

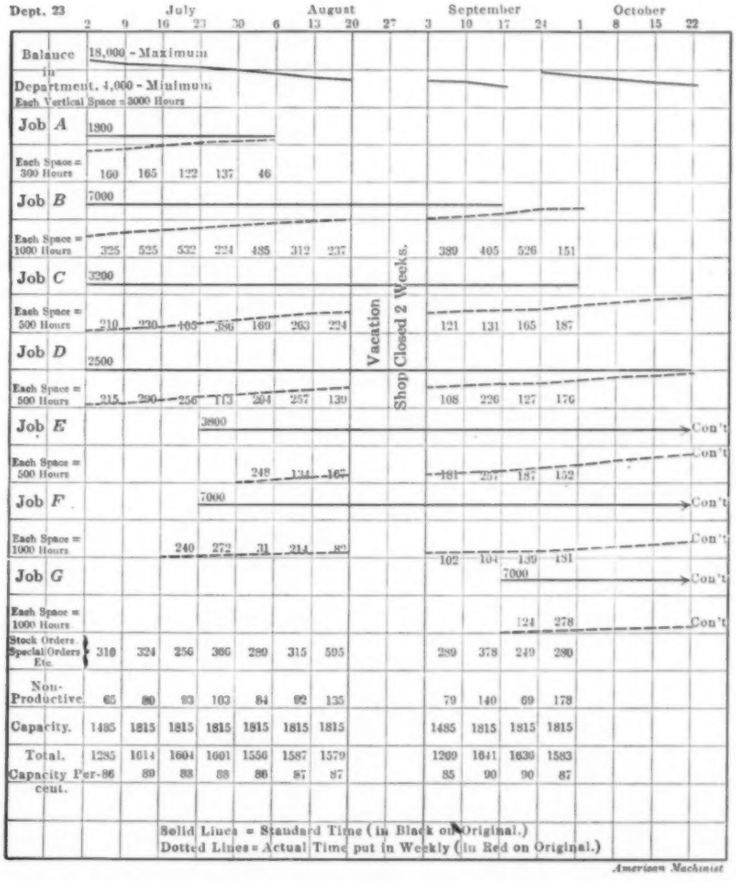


FIG. 6. SPECIMEN SECTION OF A DEPARTMENTAL CAPACITY AND PROGRESS CHART

work is in his department ready to be worked on.

At the same time the card clerk enters on the back of the master card in the "out" column the date when the work was transferred from the department which had just finished the first operation, and in the "in" column the same date against the department that received it.

This process of transferring the operation cards back and forth, and entering the transfer dates on the back of the master cards is continued until the job is finished.

Filing the Master and Operation Cards

In the interval between the finishing of one lot of machines and the beginning of another lot of the same size and kind, the master cards are filed in a transfer case and remain unused. As soon as an order is entered for a new lot, the order clerk takes out these cards, makes his entries as indicated above, turns them over to the card clerk, and he files them behind a tab bearing the job number. As the rough material for a part called for is sent into the shop, the corresponding master card is filed behind the sub-tab giving the department name where the pieces have been sent. As transfers are made from department to department, the corresponding master cards are transferred from place to place, so that at any time the cards filed behind a given department name show the work that particular department has to do on that particular job number. When the part is entirely finished, the card is removed from the working case to the transfer case to await another job order.

Thus, a glance at this file at any time shows by the number of cards the number of pieces on a particular order that are awaiting rough stock and the number that are in each department of the shop. If a detailed idea is wanted as to just what the parts are, an examination of the cards furnishes it.

In case it is necessary to split a lot of pieces going through the shop, a supplementary master card is made out and filed with the original but distinguished therefrom by a wire clip snapped on to the edge.

The operation cards are filed according to job number and part number in two files, one incomplete, the other complete.

How the Charts are Plotted

Fig. 6 shows a representative, not actual, section of a departmental capacity and progress chart as compiled and used by the production engineer.

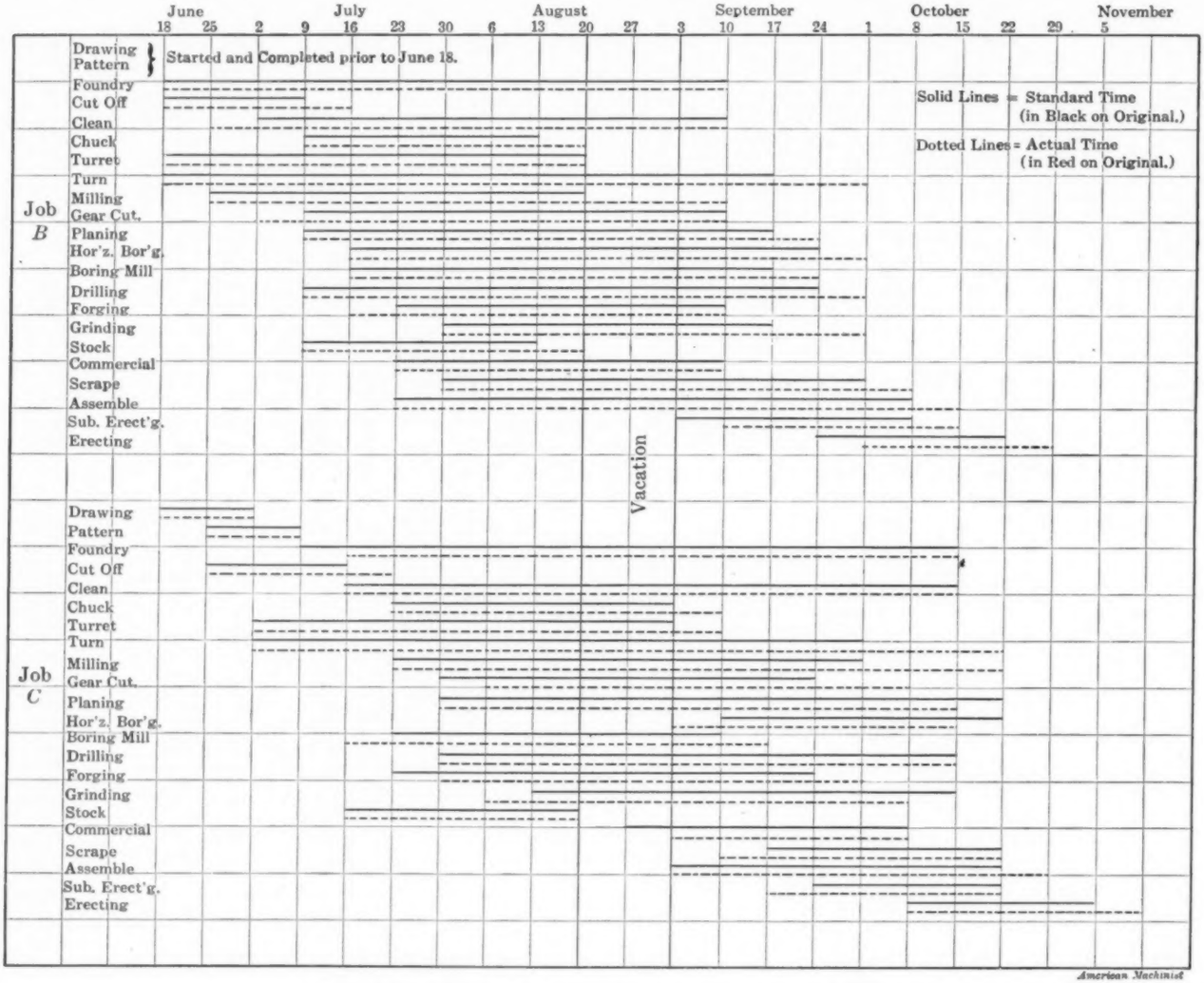


Fig. 7. Representative Section of the Summary Chart

The straight horizontal lines indicate the total number of estimated hours that the department must work to complete its part on jobs *A*, *B*, *C*, etc. The accompanying irregularly upward sloping lines show at each vertical line intersection indicating the end of a week, the total number of hours that have been worked by the department in question on the corresponding lot. The relative vertical position of the end of each irregular line indicates graphically the amount of work that the department has done and is to do on that particular lot

of machines. As a matter of fact, the estimated number of hours required is usually slightly greater than the actual time worked to complete a job.

At the upper part of the chart is shown a summation made at the end of every week of the total number of hours of work in the shop awaiting that department.

At the bottom of the chart is the total number of hours worked each week by the department. This number, compared with the product of the number of machines in the department and the number of hours worked per week, gives the capacity factor for that department. Thus these charts show at once the capacity factor of each department, week by week; the number of hours worked in each department, week by week; the total number of hours of work ahead of each department at the beginning of each week; and, the number of hours of work done and to be done on each job in the shop at the beginning of each week.

The data from which the departmental charts are plotted are taken from the labor distribution gotten by tabulating machines. These data are the number of hours worked in each department each week.

The position of the estimated-number-of-hours line and the number of weeks that this line extends over on the chart are fixed by the manufacturing conditions in the plant. If it is necessary that a certain lot of machines should be finished on a certain date, the scheduling lines on all of the departmental charts are so plotted as to bring the finish of the work at the time desired. The corresponding line of performance shows at once how nearly the schedule is being lived up to.

Fig. 7 shows a representative section of the summary chart. This is ruled with horizontal black and red lines. The black indicate the schedule for the job in each department; that is, when work on that job was scheduled to begin and end. The paralleling red line shows when work actually commenced and when it was actually finished. This chart is, of course, plotted from the departmental charts. As arranged it is on a long roll of cloth-backed paper having a width sufficient to cover the months for a period of two years and a length sufficient to handle the number of job orders for a period of four years. Thus it is really a four-year chart, the upper half serving for the first two-year period and the second half for the other.

The Foreman's Weekly Schedule

Every Monday morning each foreman receives a schedule of his work for the ensuing week, tabulated according to job number and hours. See Fig. 8 for such a specimen schedule. These are made out by the production engineer from the information before him on his departmental charts from the needs of the business and from an examination of the master-card file. The instructions tell the foreman how many hours he is to work that week on certain jobs, and that he is to finish certain others. He is not hampered in his selection of particular jobs for particular men or particular machines. All of that is left to his own discretion. He is, however, required to do a certain number of hours' work on certain job numbers. By so doing he is adhering to the prearranged schedule and doing his part toward finishing a certain lot of machines on a certain date. This is the work-controlling feature of the system.

To summarize, briefly, the master-card file shows where every piece of every order is in the shop, the route that it is taking, the number of operations that have been performed and the number remaining to be done, or if raw material is being awaited.

The departmental charts show the capacity factor of each department, the number of hours of work ahead of that department, the number of hours' work done on each job, by that department, and the number remaining to be done. These two records in combination form the basis of the control of production exercised through the foreman's weekly schedule.

There are a few other details of the system to care for special conditions; of these only two will be mentioned.

In case a foreman fails to receive work so that he can follow his schedule, he fills out a departmental delay report, Fig. 9, and forwards it to the shop superintendent. In case material is spoiled or found to be defective, a report is filled out on a form, Fig. 10, and forwarded to the superintendent, in order that a replacement may be made and thus keep up the schedule. A replaced work tag is issued identical with Fig. 4, except that it has a distinguishing color.

THE BULLARD MACHINE TOOL CO.
DEPARTMENTAL DELAY REPORT.
Dept. Date 191
SUPERINTENDENT—
Work in this Department will fall behind Shop Schedule unless following material is furnished immediately.

JOB ORDER No.	No. PIECES	MATERIAL	REMARKS

Foreman

FIG. 8. FORM FOR DEPARTMENTAL DELAY REPORTS

THE BULLARD MACHINE TOOL CO. No. 3051
SPOILED OR DEFECTIVE MATERIAL REPORT.
Issued from Dept. Date 191

Job No. Piece No.
No. Pieces Name of Part
Rejected in Department
Cause
Time Foreman
THIS CARD MUST BE SENT TO SUPT.'S OFFICE AT ONCE WHEN FILLED OUT.
SPACES BELOW MUST NOT BE FILLED IN BY FOREMAN.
Disposition
Remarks
Charge to
Date Required Date Delivered
Approved Supt.

OPERATIONS COMPLETED	
Clean'g	Hard'ng
Cut off	Polish'g
Check'g	Grind'g
Turning	Slotting
Milling	Buffing
Drilling	Gear Cut
Bor Mill	Assem'g
Hor Bor	Erect'g
Plan'g	
Scrap'g	
Sc. Mach.	
Forge	

AMERICAN MACHINIST

FIG. 9. FORM FOR SPOILED- OR DEFECTIVE-MATERIAL REPORT

For the ensuing week please arrange to spend time as follows:

Job 1	200 hours.
Job 2	50 hours.
Job 3	200 hours.
Job 4	200 hours.
Job 5	Finish.
Job 6	Finish.
Job 7	Finish.

SPECIMEN FOREMAN'S WEEKLY SCHEDULE

Efficiency of Machins

The average working efficiency of machines is about as much of a mystery as anything in the machine business. We can get plenty of information as to record performances, of milling a given piece of work in 17 seconds, or of threading a bolt in 3 seconds, but when it comes to knowing how many pieces a month we can count on, we are all at sea.

One manager of a plant where the automatics number close to the hundred mark, figures about 80 per cent. of the theoretical output for the time the machine is in operation. He allows 10 per cent. for tool changing and sharpening and another 10 per cent. for unforseen delays, but has not figured out any percentage for setting up the machines, so that the total month-by-month efficiency is still a mystery.

This is a field for profitable study, with a view toward cutting out the delays, many of which are undoubtedly avoidable.

Machining Work by End Grinding

Special Correspondence

Unusual examples of the application of a vertical end-grinding machine on a variety of interesting work.

Extended use of magnetic chuck, so arranged to allow the use of clamps and other holding devices.

The machining of metal surfaces by grinding is receiving more and more attention, and new machines are being developed to handle the work satisfactorily and economically. The vertical-end grinding machine, made by the Blanchard Machine Company, Cambridge, Mass., and illustrated in detail some months ago, is being used on a variety of interesting work, a number of rather unusual examples being shown in the accompanying illustrations.

The magnetic chuck is used in nearly all cases, but is provided with tapped holes to allow the use of clamps and supplementary holding devices, as will be seen. A good idea of the size of the work being ground can be obtained in all cases whether a scale is shown or not, by remembering that the magnetic chuck is 36 inches in diameter.

Fig. 1 shows the grinding of six rings for ball races of carbon steel and 7 9/16 inches outside diameter. These are simply placed on the magnetic chuck over a strap or holding piece, which takes the thrust of the wheel, these pieces being held in place by the cap screws shown.

Fig. 2 shows a similar number of guards being finished from the rough castings in five minutes, which makes 50 seconds for each piece. These castings are 8x9¾ inches, and have an area of 21 square inches to be ground. They clean up with the removal of about 0.06 inch of stock. Each piece rests on parallel strips and is clamped by a stud and strap in the center.

Grinding 42 Pieces at Once

Fig. 3 shows how a large number of pieces are ground at once, being held by steel rings placed between the different rows. These pieces are soft-steel drop forgings, being made double, as can be seen by close examination. Forty-two of these are finished on both sides by the removal of 0.02 inch and with a limit of 0.001 inch, at the rate of 120 pieces per hour.

Considerably larger work is shown in Fig. 4, each piece being 7½ inches in diameter and case hardened on the end being ground. This end contains 26.5 square inches of net area and about 0.006 inch of stock is removed. These are ground at the rate of 1 minute for both ends of each, or 6 minutes for grinding both ends of the six cylinders.

Fig. 5 shows how drilling-machine vises are finished after being assembled.

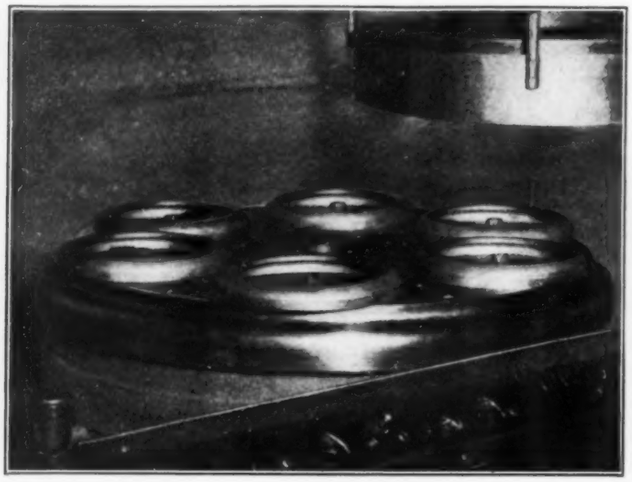


Fig. 1. Grinding Ball Races

Fig. 2. Surfacing Six Castings

Fig. 3. Grinding Forty-two Drop Forgings at Once

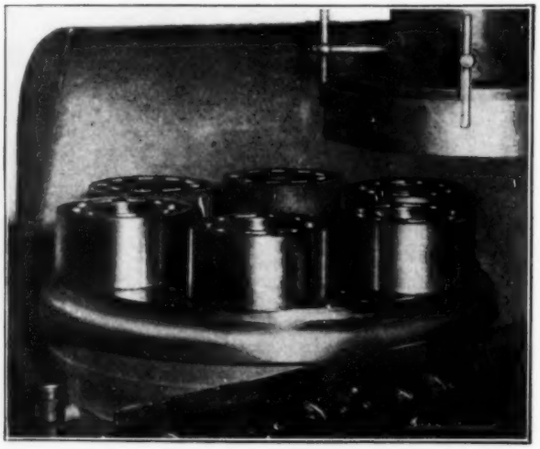


Fig. 4. Facing Hardened Cylinders

They are simply dropped over studs and held magnetically. The vises have cast-iron jaws with steel faces and present 28 square inches of area, which requires the removal of about 0.031 inch to clean up. These are handled at the rate of 25 per hour.

Multiple Grinding Fixtures

Fig. 6 shows a multiple grinding fixture for handling 16 hardened-steel rolls at one operation. Modifications of this can readily be made to hold other work or to hold more pieces at one setting. This holds sixteen 2-inch hardened-steel rolls and removes 0.004 inch with a limit of 0.001 inch. It requires 1½ minutes to grind the whole number of pieces on one end.

Fig. 7 shows a fixture for holding the work to be ground. This fixture consists of a cast-iron base which is held by the magnetic chuck and which in turn holds the work to be ground so that the upper surface may be finished parallel with the other face, grinding the upper face parallel with the axis of two interior trunnions. These trunnions rest in V's on the upper end of the blocks shown in the center of the fixture, while the central straps clamp them in position by means of a stud.

Coming to considerably larger work, we have the casting shown in Fig. 8 which is 14x19¾ inches presenting an area of 104 square inches to the grinding

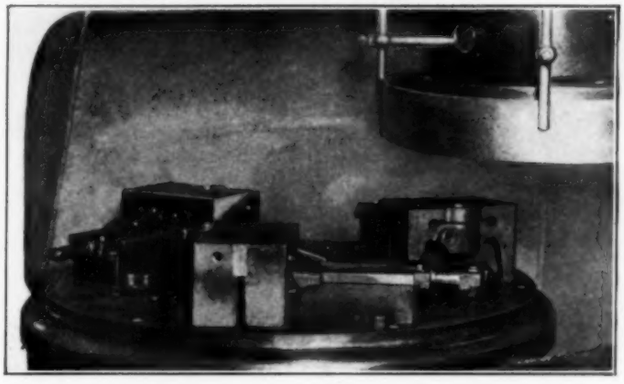


Fig. 5. Finishing Three Drill-vise Jaws

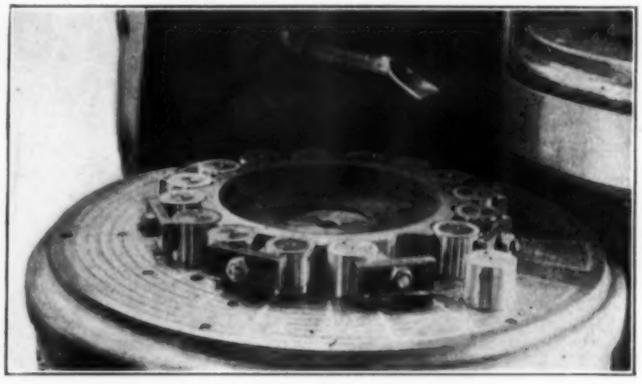


Fig. 6. Grinding 16 Hardened-steel Rolls

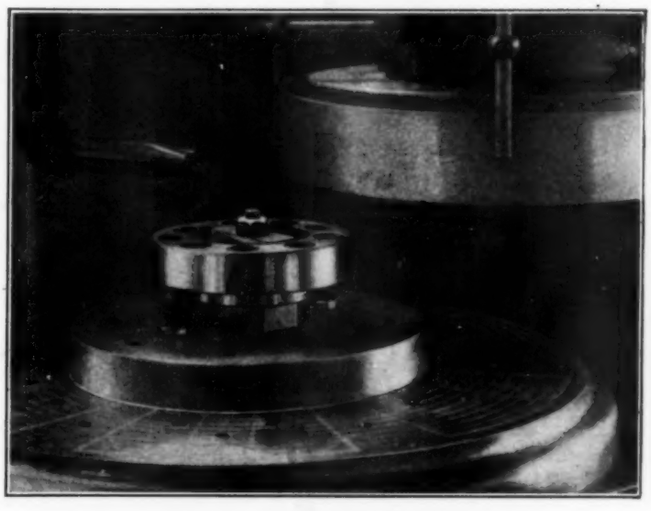


Fig. 7. Grinding Fixture on Magnetic Chuck

Fig. 8. Facing a Large Casting

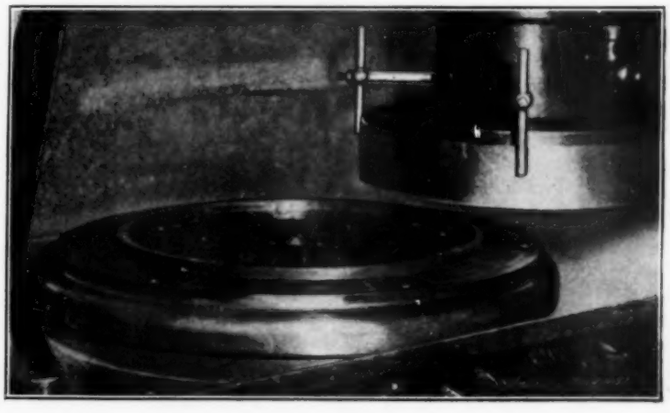


Fig. 9. Facing a Piston Ring

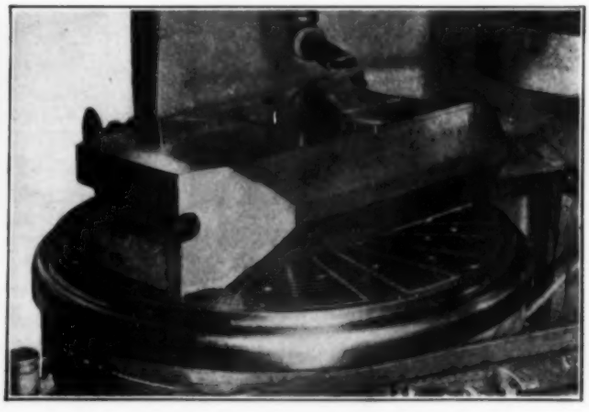


Fig. 10. Grinding a Hammer Head

wheel. In cleaning up these castings, the amount of stock removed averages 0.07 inch and a piece can be ground in 6 minutes.

The piston ring in Fig. 9 is 22 inches outside diameter and 20 inches inside. This is ground from rough turning, the material removed being 0.014 inch and the limit 0.001 inch. It is held magnetically with the addition of stop screws to prevent sliding on the surface of the chuck. The grinding time is 3 minutes which includes both sides. Piston heads are ground in the same way where it is desired to finish them all over in order to reduce clearance in the cylinder.

Fig. 10 shows a large steel casting for a drop hammer being ground on one side after rough planing. The dimensions are 8¾x20½ inches and the casting was cleaned up after the rough planing in 1 minute 30 seconds.

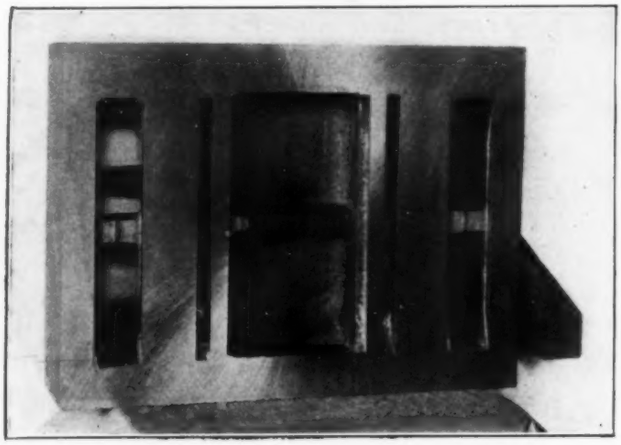


FIG. 11. A VACUUM VALVE USED WITHOUT SCRAPING

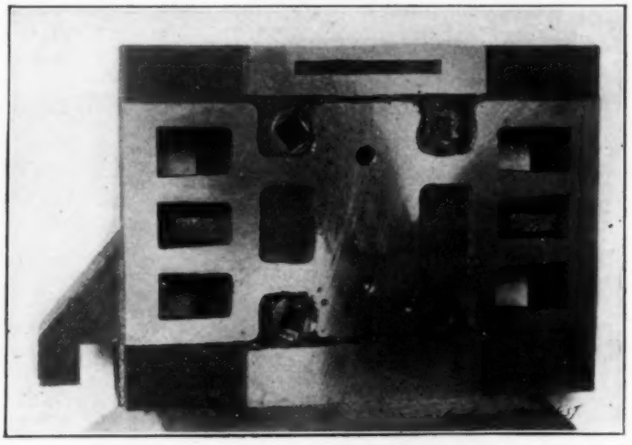


FIG. 12. BACK SIDE OF VACUUM VALVE

WHEEL MARKS ARE DECEPTIVE

Perhaps the most interesting job of the lot is shown in Figs. 11 and 12. This is an air valve for a vacuum pump and measures 8½ by 11 inches on the face. Both sides were rough planed, leaving 1/64 inch for finishing, and the limit is 0.022 inch. These were ground on both sides at the rate of 10 per hour.

The interesting part of this job, however, is that in spite of the wheel marks, which show very plainly both on the valve and in the illustration, these valves were used without scraping and, under test, showed a vacuum equal to the scraped valves previously used.

Another interesting example is shown in Fig. 13 which is a test block for cast-iron headers and nuts for boiler use. As can be seen from the surface of the nuts and the header, the wheel marks show very plainly, yet they stood a pressure of 450 pounds per square inch when put together with the surfaces clean. These nuts were ground from the rough at the rate of 150 per hour.

The wheels used on these machines are 16 inches in diameter and, on account of the heavy work they do, the method of holding them becomes quite a problem. The large surface in contact with the work makes a soft wheel necessary and the usual method of clamping is apt to crack the wheel. The makers of the machine have obtained the best results by setting the wheels in the holders with portland cement. This holds them firmly in place without undue strain and no tendency to crack the wheel.

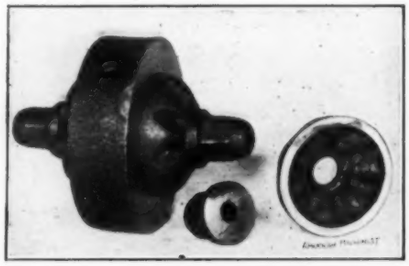


FIG. 13. CAST-IRON BOILER-TUBE HEADERS

The Need of Rapid Power Traverse

BY JOHN R. GODFREY

If anyone has lingering doubts as to the advisability of rapid power traverse on even moderate size machines, let him spend a few minutes watching the operations of machines with and without it. After a man has cranked a tightly gibbed tool head or a heavy table for a couple of feet he begins to feel that the summer vacation can't come too soon and he slows down appreciably while nature gets a few doses of restoratives into the tired muscles. Sometimes he has to stop entirely to think it over, whether it is piece work or not.

In either case you lose in the output of the machine and, what is fully as important, you lose in the accuracy of the work.

But when a man can push a little lever and see the table or tool head go waltzing down the line at 40 to 60 feet a minute, it is different in every way. It takes less time, it sets a faster pace which he follows unconsciously and he isn't tired out with a lot of work that he knows is useless.

Of course he wouldn't mind cranking up an automobile if he owned one, but that's different with any of us. It isn't half as hard to run your legs off playing base ball as it is to walk half a mile to church.

But the power-traverse idea is growing by moral suasion and otherwise. One recent case shows the power of a good example in such cases.

A large shop had recently bought a modern boring mill with the latest ideas on power traverse and soon after was in the market for a slotter. So the manager specified rapid power traverse to the table and carriage. The builders protested that they had never built one that way. Said it wasn't necessary. Said that a man needed the exercise to keep him in good condition, that the table only weighed a few hundred pounds and the men would be lonesome without the customary work to do.

But the manager had seen the light and 'twas a case of building it his way or not at all, so the makers came across as the boys say, and the slotter has power traverse. Needless to say it's the most popular machine of the kind in the shop and the men haven't shown any need of a nerve tonic to make up for the lack of exercise, as yet.

And more, the machine turns out more work than any of the others.

There's a new edict in that particular shop to the effect that no new machines are to be bought unless they have a rapid power traverse to all the parts which seem to need it in any way.

Practical Uses of the Sine Bar

By H. P. Camp *

A bar having hardened and ground plugs placed at an exactly known distance from each other, which, by means of the vernier hight gage, and a table of sines and cosines, may be set at any angle desired.

*Chief inspector, Bausch & Lomb Optical Company.

Among draftsmen and toolmakers who desire to be exact in their work, there is a lack of confidence in the accuracy of bevel protractors, especially those protractors which sell for a reasonable amount and within the means of most workmen.

To lay out an angle on the drawing board when necessary to be exact, a draftsman would preferably use the method shown in Fig. 4, which takes less time than setting a protractor if a table of tangents is near at hand, as it should be. Suppose, for instance, the angle to be 34 degrees 41 minutes. With the tee-square or straight-edge first draw a horizontal line, beginning at *A* the apex of the angle, and extending a little more than 10 inches from that point. Now turn to the table of tangents in the handbook and note that the tangent of 34 degrees 41 minutes is 0.69200. Mentally multiply the tangent by ten and obtain 6.9200. From a point *B*, which should be exactly 10 inches from point *A* on the base, erect a perpendicular line, and on this mark the point *C*, exactly 6.920 inches from the point *B*. The line *A C* then is at the required angle to *A B*.

The foregoing is so easy that we may apply the same principle in the tool and inspection rooms and make for our use a sine bar, as shown in Fig. 5.

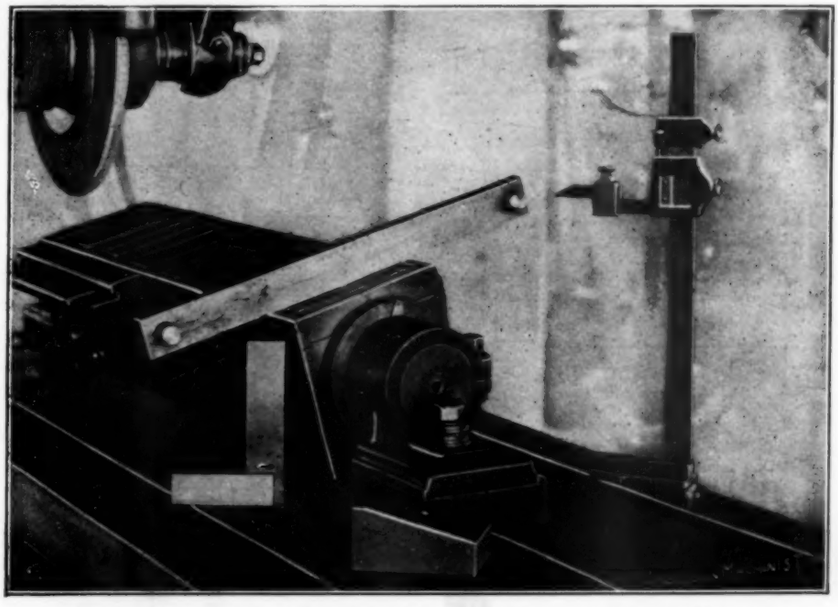
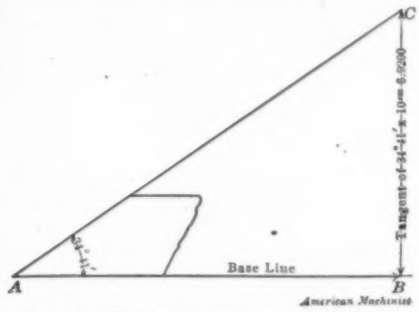


FIG. 1. USING SINE BAR TO SET MAGNETIC CHUCK TO GRIND WEDGE SHOWN IN FOREGROUND

CONSTRUCTION OF THE SINE BAR

The sine bar consists of three parts; the main part or straight-edge is of soft steel, ground all over, and into this two hardened and ground plugs *A* and *B* are forced, one at each end. The plugs must be equal in diameter and the distance apart some even dimension, such as 10 inches, or 5 inches, so that the process of multiplying or dividing the sine or cosine becomes a mental one, as will be observed later. The edges of the bar and the back must be ground parallel to



FIGT. 4. CONSTRUCTING AN ANGLE BY MEANS OF TANGENT

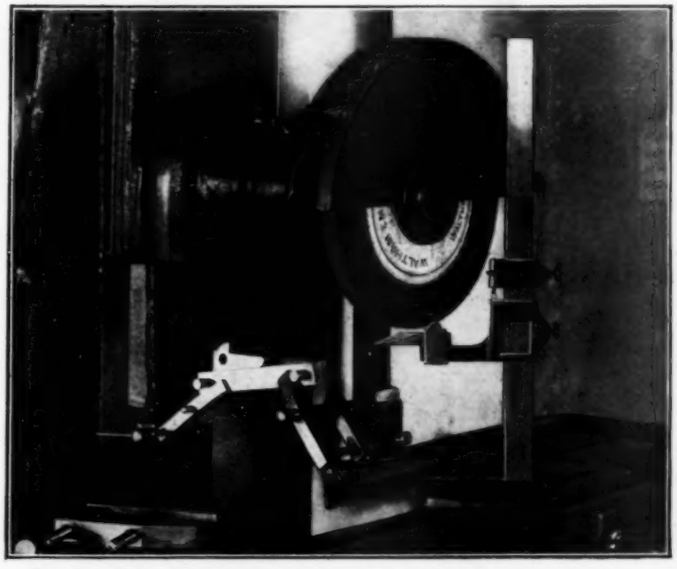


FIG. 2. USING SINE BAR TO SET A PIECE FOR GRINDING TO AN ACCURATE ANGLE

FIG. 3. CHECKING THE SETTING OF A TOOLMAKER'S VISE BY MEANS OF A SINE BAR

and square with the plug centers. The sine bar can be made by any careful toolmaker for less than the cost of a good protractor.

With the sine bar we can either find what an angle is or we can locate a piece of work to the proper angle with a high degree of accuracy. When using the 10-inch sine bar, we can mentally multiply or divide the sine or cosine by 10; simply imagine the decimal point moved one place to the right when multiplying, and one place to the left when dividing. With the 5-inch sine bar, we may either multiply by five or, which is the same thing, mentally divide by two and move the decimal point one place toward the right. When finding the angle, we either divide by 5 or, which is the same thing, mentally multiply by 2 and move the decimal point one place toward the left.

Examples of Its Use

In the halftones, Figs. 1, 2 and 3, three different uses of the sine bar are shown and several practical problems are worked out in the line cuts, which the following explanation will make clear.

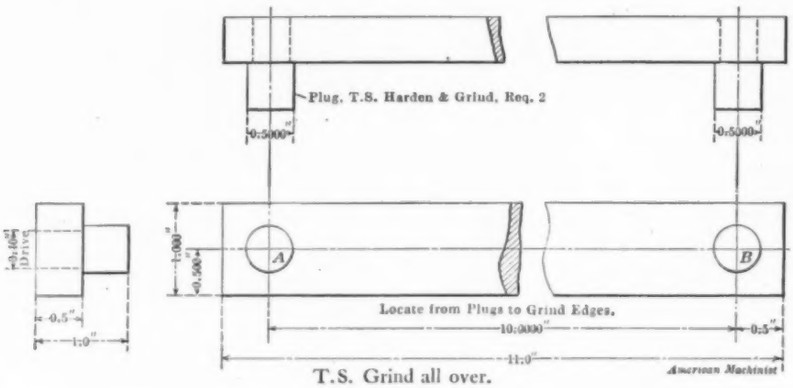


Fig. 5. Details of Sine Bar

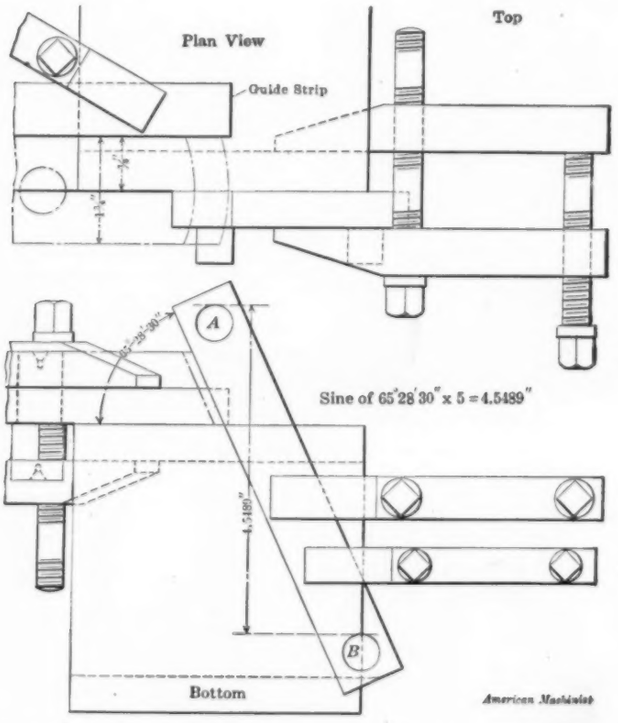


Fig. 6. Five-inch Sine Bar Used As a Gage for Angle of Piece Shown in Fig. 7

Fig. 6 shows the sine bar clamped to a 4-inch cube, using two toolmakers' clamps, and in a position to be used as a gage for testing the accuracy of the angle 65 degrees 28 minutes 30 seconds, which is the angle to be ground on the end of the piece shown in Fig. 7. This piece is used as a gage and is ground on centers. Note that the guide strip is clamped to the top of the cube to lay the work against, so as to insure gaging the angle on the center line of the work.

To set the sine bar, clamp it in position as shown in Fig. 6, approximately correct; now from a table of sines find the sine of the angle 65 degrees 28 minutes 30 seconds. (Just imagine setting a protractor to such an angle!) Having found the sine to be 0.90978, we multiply it by five, as we are using a 5-inch bar, giving 4.5489 as the vertical distance from plug *A* to plug *B*. This may be measured either from top to top or from bottom to bottom of the two plugs. With the vernier hight gage we make final adjustment of the sine bar until it is located correctly, then clamp firmly. Set the outfit with its back to the light and we can see just what we are getting.

In Fig. 8 we have a case where the angle 75 degrees 22 minutes 40 seconds is a very important one and must be ground accurately with the back edge. In this case, for the sake of greater accuracy as well as convenience, we take from our table of cosines, the cosine of 75 degrees 22 minutes 40 seconds, which is 0.252444. Multiplying by 5, we obtain 1.2622, which is as close as one would care to work, considering the fact that any errors which may be made in measurement will be divided by 5, which is the length of the bar. As in the previous case, we measure the vertical distance from plug *A* to plug *B* with the vernier hight gage and obtain far greater accuracy than we could with a bevel protractor. With the sine bar firmly clamped, any number of pieces may be laid on the edge of the sine bar and clamped against the angle iron. Then, the whole outfit may be placed upon the magnetic chuck of the surface grinder and the angle ground with a cup wheel, as shown in Fig. 8.

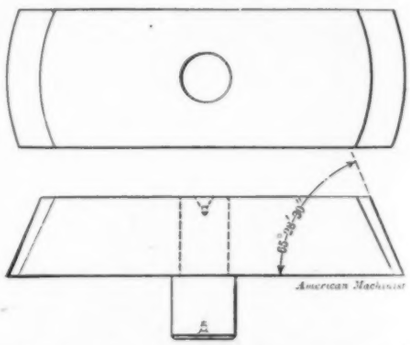


Fig. 7. The Work Gaged in Fig. 6

Gaging a Taper Reamer

Suppose we have some taper reamers to grind. To do the job accurately let us use the fixture shown in Fig. 9. Here we have two sine bars clamped in position or, if we have only one, we can use a standard straight-edge instead of the lower sine bar; but the upper edge must

be a sine bar because we are going to measure the vertical distance from plug *A* to plug *B*, as in previous examples. The lower sine bar, or straight-edge, if used, is perfectly horizontal, rests upon

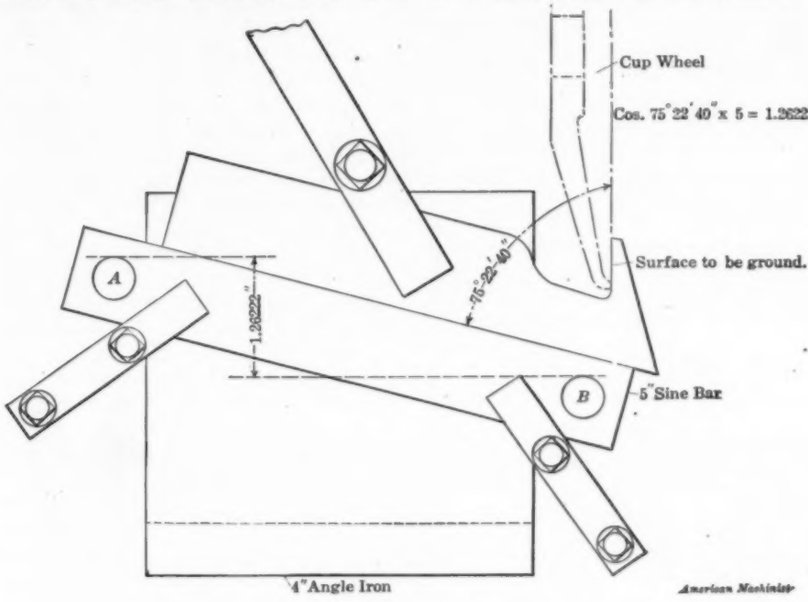


FIG. 8. ANOTHER EXAMPLE OF USE OF SINE BAR

the shoulder *C*, as shown, and is firmly clamped in position.

In this case the reamer is a No. 11 Brown & Sharpe taper, so we may set the upper bar by laying the No. 11 standard taper plug between the sine bars. We may also obtain the angle by measurement. As the taper of a No. 11 Brown & Sharpe reamer should be ½ inch per foot, or 0.04166 per inch, and supposing we are now using a 10-inch sine bar, we multiply 0.04166 by 10, obtaining for an answer 0.4166 inch as the vertical distance from plug *A* to plug *B*. By the aid of our vernier hight gage, as in previous examples, we may set our upper sine bar. In this case we do not need to interest ourselves in knowing of what angle 0.04166 is the sine. Then, by setting the fixture with its back to the light, we may try the reamer and see just what we are doing, which is far better than feeling around inside of an external taper gage with blue paint as an indicator.

GENERAL USES

The sine bar can be used to advantage in many ways; for setting vertical heads, universal heads, milling-machine tables, or in a variety of other ways, as may suggest themselves. From the examples given it should be easy for any toolmaker possessing a table of sines and cosines to devise ways for its use and save a great deal of trouble when a correct angle is required. It is just as easy to find out what an existing angle is, by first setting the sine bar to the surface and then measuring and looking in the table for the angle, as it is to produce an angle by the methods shown in the examples.

Tables of sines and cosines, as well as other functions, can be found in almost any handbook, together with a mass of other information which every toolmaker should have at hand.

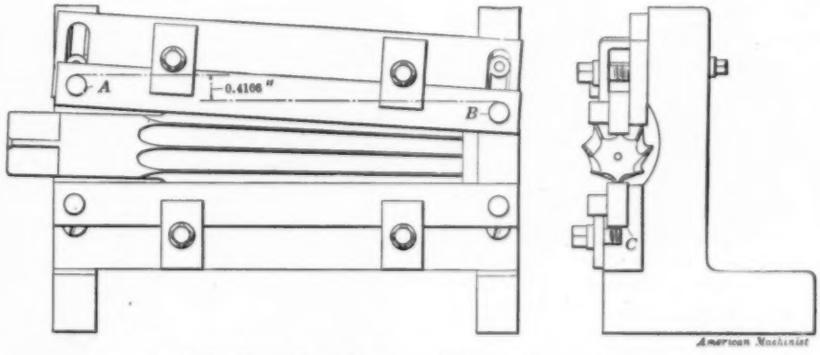


FIG. 9. SINE BARS SET FOR TESTING TAPER REAMER

Exhausters for Cylinder Grinders

In grinding cylinders for automobiles and other gas engines, it has become customary to use exhaust fans for removing the metal cut away by the wheel, and the particles of the grinding wheel itself. This leaves the surface of the work clean for the grinding wheel, particularly in the machines where the wheel travels around the bore of the cylinder, as, if the grindings are not removed, the wheel must pass through them at each revolution.

As there has been some question in regard to the size of exhaust fan necessary to handle this properly, we are very glad to present communications from builders of grinding machines showing what their experience has proved necessary in this work.

The Brown & Sharpe Manufacturing Company informs us that it uses a No. 00 Sturtevant exhaust fan of the Monogram type, having an inlet 4⅞ inches in diameter, and an outlet of 4⅛ inches, the fan being run at 2800 revolutions per minute, and consuming about ⅛ horsepower; this being given as ⅜ horsepower for 4000 revolutions, according to the makers of the exhauster.

The power required depends on the conditions in which the fan is used, and whether the suction is through a long line of pipe, or whether it is close to the machine. In their later machines, where the exhaust fan forms a part of the machine equipment, the receptacle for grinding is at the base of the machine itself, the power would be at a minimum, presumably in the neighborhood of one horsepower at the speed mentioned.

In connection with this subject, the Heald Machine Company gives the practice: "We are using fans of the American Blower Company's make, known as their A.B.C. type "V," size No. 1, which has a wheel 8½ inches diameter with a case about 14 inches diameter, having an inlet of 4¼ inches. These fans, we believe, require about ½ horsepower and run 3500 revolutions per minute, delivering about two ounces pressure."

The addition of chromium to pure iron without carbon does not give good results according to *Génie Civil*. An alloy containing 5 to 6 per cent. of chromium with 0.75 to 1 per cent. of silicon and 0.3 to 0.5 per cent. of carbon is excellent. An alloy containing 8 per cent. of molybdenum, 0.3 per cent. of vanadium and 0.6 per cent. of carbon makes good permanent magnets, which preserve their magnetic properties above 1000 degrees Centigrade. Alloys of tungsten and iron are useless, except one which contains 4 per cent. of tungsten and 0.4 per cent. of vanadium; this makes an excellent permanent magnet.

Foundry Lighting Problems

By C. E. Clewell *

Sufficient light is of prime importance in the foundry, owing to the dark surfaces, foggy atmosphere and hazards incidental to the work. With the newer, more efficient lighting units much better results can be obtained than were possible with the older units and methods of installation.

*Lighting expert, Westinghouse Electric and Manufacturing Company, Pittsburg, Penn.

In all the range of industrial lighting problems one of the most difficult is that of the foundry. The problem is not alone one of furnishing adequate light for the work, but also for the prevention of accidents due perhaps to a stumble over hot metal, an accident apt to occur when the atmosphere is filled with clouds of steam and smoke at the time of pouring.

Items Peculiar to the Foundry—Dark Surfaces

The molds and surfaces are in general dark. In addition to this fact, the walls and ceiling are usually very dark and absorb instead of reflect the light. Fig. 1 shows the conditions found in a typical foundry. Note the floor space crowded with molds. A dark surface always requires more illumination than a light surface from which much of the illumination is reflected. For this reason more or larger lamps will generally be required in foundries than in most of the other classes of industrial work places.

Shadows

In forming the molds it is often necessary to look down into openings. In touching up a mold the workman should be able readily to detect uneven places on the surfaces, not only on the outside of the mold but also in the openings and pockets. Unless special attention is given to the minimizing of shadow effect, these openings will likely be in a shadow, making the work trying if not well nigh impossible. Hence the reduction of shadows by the use of a large number of medium-sized units is an item of considerable importance.

Dust and Dirt

There is apt to be much dust and dirt as well as steam in the air. This dust and steam will produce two effects. First they form an obstruction through which the light must pass in getting from the lamp to the work. This item may cut down the light to a great extent. Second the dust and dirt settles on the lamps and soon reduces their efficiency very materially. This renders it necessary to provide a light which will penetrate the foggy atmosphere, and also a lamp which will be subject to dust and dirt accumulations as little as possible.

Requirements of an Ideal Lamp for This Service

The ideal lamp for foundry lighting, therefore, should be an efficient lamp on account of the dark surroundings and surfaces; a lamp that will produce a penetrating light and at the same time be relatively unaffected by dust and dirt; one of medium size so that many lamps can economically be used, thus reducing shadows. By a medium-sized lamp is meant one with candle power lying between that of the arc lamp on the one hand and the carbon filament lamp on the other. Thus the tungsten, the Nernst and the Cooper Hewitt lamps all come under the classification of medium-sized units. In like manner the efficiency of these lamps is high so that they may economically be used in large numbers. On account of the large amount of dirt associated with the foundry it is evident that a lamp possessing mechanism is not very desirable on account of the likelihood of dust and dirt getting into and clogging the various parts. Based on this feature the tungsten lamp, for example, in the larger sizes is an excellent type for the service in question. The arc lamp is also adapted to some cases of foundry work, particularly when the lamps must of necessity be mounted high above the floor. The large volume of light produced by either the yellow-flame or the metallic-flame arc lamps makes them suitable for many cases of foundry lighting. The Cooper Hewitt lamp is also a suitable lamp for the foundry. The light of this lamp is penetrating in a peculiar manner. It is available in a large variety of sizes and seems but little affected by dust and dirt accumulations. The mechanism of the lamp is furthermore such as to be practically unaffected by the dirt in the air. Figs. 1 and 2 show foundry buildings equipped with Cooper Hewitt lamps. These photographs were taken during the day and are not intended to show the illumination effect of the lamps. They do, however, indicate the arrangement of the lamps and the general result from mounting medium-sized lamps overhead in the production of a well distributed light of low shadow effect.

Fig. 1. Effect of Medium-sized Cooper Hewitt Lamps

Foundry Lighting as an Economy

During dark cloudy days and in the early morning and late afternoon hours of the winter, and in some cases, where the daylight facilities are poor all during the day, artificial light will be required. The question involved in providing the best obtainable artificial light will be somewhat as follows: Can the general quality of workmanship be im-

proved by good light all during the day? Will the stimulating effect of bright surroundings be an aid to cheerfulness of mind and action? Will mistakes be avoided? Will accidents be prevented and will eye fatigue and eye strain be reduced by furnishing a light free from glare and of suitable intensity for all the conditions of foundry work? It is evident that such questions are difficult to answer in a definite manner, but those familiar with foundry work will agree that good light is better from every standpoint than poor light.

The practical problem will then be to study the conditions as outlined in the preceding notes and to adapt the lamps available for securing the best possible result. It should be emphasized that while the lighting of a foundry seems simple, particularly when considered along with the other items associated with foundry equipment, it is nevertheless a more involved problem than might be expected.

FIG. 2. COOPER HEWITT INSTALLATION

THE EFFICIENCY OF THE FOUNDRY AND THE WORKMAN

In the foundry the efficiency of the man is of paramount importance. It is, of course, essential to provide adequate and efficient machinery and tools for making the molds, and suitable material and accessories, but the workman is here the chief consideration. The work is naturally trying from the physical standpoint. Great heat, dust and dirt, vitiated air, all contribute to the fatigue of the man; furthermore there are numerous hazards. How can his powers of endurance be promoted and conserved, is an important consideration. Obviously the lighting is one of those factors which will be an aid in maintaining the workman's efficiency throughout the day.

MECHANICAL ITEMS

Foundries are generally equipped with crane service, which prevents the use of individual carbon-filament lamps hanging from the ceiling. Fig. 1 shows the construction and arrangement of a typical foundry and indicates the impossibility of installing drop lamps at the ceiling, due to the crane and also to the ceiling hight. In cases of this kind, lamps must be used which will be of suitable size for the clearance between the crane and ceiling. The hight of the ceiling is a factor of considerable importance in any lighting problem, but is probably more so with the foundry because of the necessity for providing large quantities of light on dark surfaces. With ceilings of more than 30 feet hight, it is advisable to use comparatively large lamps due partly to the large distance between the lamps and the work, and also to the reduction of the light by the foggy atmospheric conditions.

POINTS RELATING TO THE LIGHT

Two items regarding the light in foundry work call for special attention. The one is the effect due to the bright light from a lamp shining into the eye, commonly called the glare of the lamp; the other is the matter of providing illumination of sufficient intensity and of suitable distribution for the needs of the work.

To avoid glare, the lamps should be mounted well out of the range of vision and should be protected by suitable reflectors or globes. Fig. 3 indicates the reduction of glare by mounting the lamps high and well out of the range of vision. The reflectors while serving to protect the eye from the bright rays of light, may also be selected so as to direct the light from the lamps in a downward direction, which will, of course, be the most useful, whereas if no reflectors are used, much of the light from the lamps is apt to be wasted on the ceilings and walls of the building.

As previously stated, the best distribution of the light will result by the adoption of medium-sized lamps so spaced as to produce a uniform light all over the floor space, thus reducing the shadows which are very objectionable. Some authorities specify an intensity of three foot-candles* on the work in the foundry. Due to the very dark surfaces and surroundings, intensities of even higher value than three foot-candles may often be necessary. It is hardly probable, however, that an intensity of this value will be required at every point on the floor space at any given time, but there is a likelihood that work may be done at any point of the floor from time to time, hence the advisability of equipping the entire building with adequate light, the lamps being controlled in such a way that they may be turned out when not required at certain places.

FIG. 3. REDUCING GLARE BY USE OF MEDIUM-SIZED LAMPS

SEPARATION OF LIGHTING AND POWER CIRCUITS

In foundry work, as in most classes of industrial work, it will be found advantageous as far as the operation of lamps is concerned, to supply them with constant voltage. The power load will nearly always exceed that of lighting, and due to the fluctuations of the power load, the variations of voltage are apt, under these circumstances, to be excessive. If the lighting and power circuits are seperated from the bus bars outward, much trouble in the operation of the lamps may be avoided from this source.

*The foot candle is the unit of illumination intensity and may be defined as the intensity of the light normal to a surface one foot distant from a standard candle.

The Advantages of Good Light for the Foundry

A saving of several minutes per day for the workmen will soon pay for the entire cost of installing and operating a suitable foundry-lighting system; that is to say, some artificial light is always a necessary part of the foundry equipment, hence the question will lie between good and inferior lighting facilities, and it can be shown that any differences between the cost of good and inferior lighting are very small in terms of wages of the workmen. Adequate light will increase the output of the foundry and will promote the efficiency of the workmen. Good artificial light will, therefore, be an aid in keeping the work up to a point of high efficiency throughout the day.

Fig. 4. Excellent Effect of Medium-sized Tungsten Lamps

Fig. 5. Another Satisfactory Installation of Medium-sized Tungsten Lamps

The Proper Care of the Lighting System

The best results will be realized from the lighting system if some reasonable care is given to its up-keep. The lamps should be inspected at frequent intervals, preferably once each day, and the accumulations of dust and dirt on the globes or reflectors removed by frequent cleaning. Dust and dirt deposits on the globes of lamps cause such a large depreciation of the light that a small expense for maintenance will be far more than offset by the greater amount of light resulting from clean globes and reflectors. For example, an expenditure of 10 per cent. of the operating cost for maintenance in cleaning globes and reflectors may result in from 20 to 25 per cent. increase in the light, so that the economy of such care of the lamps is apparent. This feature is of particular importance in the foundry where, as before stated, deposits of dust and dirt are excessive as compared to other locations.

Summary

The requirements of foundry lighting may be summarized as follows:

(a) Sufficient light for the work involved.

(b) A fairly uniform distribution of the light over the entire floor space.

(c) Glare reduced to a minimum.

(d) The lamps should furnish a penetrating light in a downward direction.

(e) The lamps should not be greatly affected by dust and dirt.

(f) Sufficient general light should always be provided to enable the workmen to get around and to find tools readily, for floor space is usually filled with obstacles.

Fig. 6. Installation of Large Tungsten Lamps

An Erector's Drilling Kink

By E. J. Rollings

In erecting large machinery it is common practice to put in fillister-head screws half and half, on some of the press fits, as a safeguard against end movement. Some of our large faceplates are forced up to a shoulder on the shaft and as it is imperative that there be no projections in front of any kind, two ¼-inch fillister-head screws are inserted on the joint, and prove a very simple solution of the difficulty.

When the two pieces are both of the same metal, or both equally hard, there is little trouble, but where one is steel and the other iron it has often been a source of trouble, as the drill insists on running over into the softer metal, thus making a very awkward job to tap and usually breaking either drills or taps, if the hole is of any depth. It is also very difficult to get a nice-looking job, as the drill is inclined to run most when starting.

Center punching well into the metal will help to start right, but in our case the screws are on the front of a polished cutter head and must be on the joint and very neatly fitted.

I have seen men spend hours desperately tapping and retapping a bad hole, grinding the head of the bolt taper and other stunts to get it home. The following simple method obviates all of this and I will vouch for it.

Take a piece of flat steel long enough to allow for clamping in place and about ¾ inch thick, and drill through it with the tap-size drill near the center. Place it on the work with the hole over the joint where the screw is to be inserted, clamp securely and drill down the total depth required for the tap drill; put the body-size drill in the machine and without moving the plate, drill down as far as necessary. Repeat this with the drill for the head of screw, squaring out with a bottoming drill when almost down to depth of head.

The plate can now be removed, the hole tapped and screw put in without trouble or profanity.

Of course, a new hole must be drilled in the plate for every screw, and it might pay to bush the hole if a sufficient number are to be drilled in this way.

The vital point of the scheme is to always use the smallest drill first, going to depth required, taking the others in rotation, thus getting the jig feature for each drill.

Effect of Initial Stress in a Bolt

By James Clark

A new way of analyzing this problem without assuming the introduction of springs, as many writers have done.

All substances are elastic, and without "strain" or deformation no stress or pull in the material is possible. These conditions must be considered together to get at the true state of affairs.

Recently a number of articles have appeared in the columns of the different technical papers on the condition of stress in bolts which are first subjected to an initial stress by tightening the nuts; and for the purpose of compressing a gasket between two metallic surfaces sufficiently to prevent any fluid, which is to be confined by this gasket, from escaping when it is admitted into the confining chamber. There are numerous examples of bolts subjected to the conditions stated above to be seen wherever there is machinery of any description.

Let Fig. 1 represent the confining chamber, with the bolt tightened and subjected to an initial stress. Now, if we admit a fluid or a gas into this confining chamber and subject it to a pressure of, say 100 pounds per square inch, do we increase the stress in the bolt? There seem to be many persons with wrong ideas relating to this point. A number of writers try to illustrate it by assuming the inroduction of springs to take the place of the gasket, with the result that they consider the final stress in the bolt is the sum of the initial and that due to the internal pressure. Others suppose a rigid substance in place of the gasket and introduce a spring in place of the bolt, with the result that the internal pressure in the chamber does not increase the initial stress in the bolt. Both of these results are arrived at when springs are assumed, from the fact that the extension of the bolt, or the compression of the rigid substance, compared with the extension or the compression of the springs, for a given load or stress, is practically zero.

Some fail to consider that all material is elastic and that just as soon as any material is subjected to any stress, no matter how small, there is a corresponding "strain" or deformation. In the understanding of this property of proportionality between stress and strain, lies the correct understanding of the action of the stresses occurring in the bolts.

Deformation Always Accompanies Stress

In Fig. 2 is shown a pail suspended by an iron rod or wire of length l; if into this pail you put a weight P, the rod will elongate a certain, definite amount $\triangle l$. And for every time you add a weight P, the rod will elongate an amount $\triangle l$. P may have any value whatever, the only limitation being that the total weight must not exceed what is called the "elastic limit" of the material multiplied by the area of cross-section of the rod or wire. We may term this value the critical load. If the load is removed before it equals the critical value, the rod will return to its original length l; but as long as it remains suspended it will be slightly longer than it would be were it lying horizontal. This relation of direct proportion between stress and strain, and known as Hooke's law, is true also for compression.

Anyone wishing to verify the fact that iron or steel does actually lengthen or shorten under stress, may do so by fastening a couple of pointers on the wire holding the pail and standing a scale in such a position that the distance between the pointers may be read before and after the load is applied. For compression, take a piece of ½-inch round, about 5 inches long, and brighten one side; scratch two lines on it about ¼ inch from the ends; set a pair of dividers to these lines, then put the piece endwise between the jaws of a vise and tighten slowly. Trying the distance between the lines with the dividers will show that they become closer together. The making of these simple observations will impress the fact quite forcibly upon the mind of the observer.

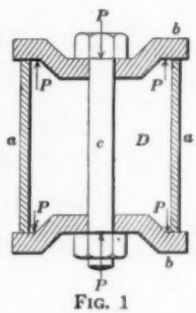


FIG. 1

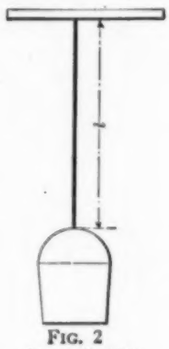


FIG. 2

American Machinist

INITIAL STRESS IN A BOLT

Definitions of Terms

I will now define what is meant by the terms "stress," "strain," "coefficient of elasticity," and "elastic limit." In Fig. 2 assume the pail is loaded with the load P; the wire is now sustaining this load, and the stress in the wire is the amount of the load P in pounds. From this it may be seen that stress in a body is that condition in which the particles are resisting an external force tending to displace them. If we divide the amount of the force by the area of cross-section, we have the unit stress p; and in this case a tensile stress, because it tends to lengthen.

When the pail is loaded the wire elongates and this elongation is called a strain. Also, when a body is subjected to a compressive stress the body shortens, and this is called a strain. Hence, any change of shape from the action of an external force is termed a strain, and for any strain there must be a corresponding stress.

If the total strain in the wire is divided by the length of wire we have the strain per unit of length. The unit stress in the wire divided by this un' strain gives us a constant value which is termed the coefficient of elasticity. This generally is represented by E, and $E = \frac{p}{\triangle}$ where p is the unit stress, or total stress divided by the cross-section; and $\triangle$ the unit strain, or total strain divided by the original length. The value of E for steel is about 30,000,000.

The elastic limit is that value of the unit stress beyond which the relation between p and $\triangle$ ceases to be constant and becomes variable. The value for soft steel is about 30,000 to 35,000 pounds per square inch.

Having illustrated and defined the three properties of materials entering into the bolt question, I will illustrate the true conditions. Fig. 1 represents a cylindrical shell a and two ends $b\,b$, which are held against the shell by the single bolt c. As sume that the shell a and the ends $b\,b$ are perfectly rigid; that is, do not strain (or change shape) for any stress put upon them, also that the end joints are ground. Now we will tighten the bolt c until the stress becomes P, and as it is not rigid it will strain, that is, lengthen in proportion to the stress applied. Now the only way to increase this stress P is by straining the bolt a greater amount; and if we admit a gas into the chamber D, subjecting it to a constantly increasing pressure, it is self-evident that as soon as the pressure is great enough, the force acting upon the ends tending to separate them will become sufficient to increase the strain in the bolts. But as soon as this occurs

our joint will leak, from the fact that the ends and shell are assumed to be perfectly rigid. Under this assumption as soon as the internal pressure becomes great enough to increase the strain, and by increasing the strain, increase the stress above the initial, our joint will leak. Consequently it is impossible to increase the stress under this assumption of perfect rigidity.

Consideration of Actual Conditions

Now let us change our assumptions and consider the shell as it really is, elastic; still considering the ends perfectly rigid. Also we will assume the shell to have the same cross-sectional area, to be of the same length and of the same material as the bolt. Now, when we strain the bolt by tightening the nut, we also strain the shell an equal amount in the opposite direction; that is, the bolt lengthens and the shell shortens. If there were any difference between the original lengths of the bolt and the shell the strain in each would be in direct proportion to their respective lengths, because the unit strain in each is the same and the total strain is the unit strain multiplied by the length.

Let us now note the effects due to initial strain: it has produced a tensile stress in the bolt and a compressive stress in the shell; the shell has also shortened and the ends are closer together, hence, the distance between the head and nut of bolt is less than originally.

Note this last effect carefully; that the shell has shortened. Since, in a body at rest one force cannot act alone, but there must always be an equal opposing force, we will consider that the bolt and the shell each exert a force P, equal to the initial stress in each, in the direction of the arrows. These are necessarily equal and their lines of action parallel and in opposite directions. The stress P in the bolt is caused by the opposition to shortening of the shell, and to be able to shorten the shell we must cause a stress in the bolt. Hence, as long as the shell remains in a strained or shortened condition some of the initial stress must remain in the bolt.

From this we can see that before the initial stress in the bolt can disappear, the strain in the shell must disappear; or, in other words, the shell must return to its original length. For the shell to be able to do this it will be necessary to increase the strain in the bolt an amount equal to the strain in the shell; but increasing the strain will increase the stress in the bolt, and as the strain will be increased an amount equal to the original strain, the stress will be doubled. This increase in strain will be caused by the internal pressure of the substance within the cylinder. Hence, when, as is the case in actual practice, the substance acted upon by the bolt is elastic, the stress caused by the internal pressure and the initial stress do combine, and the final stress is some part of the initial stress plus the stress due to the internal pressure. If, at any time, the internal pressure becomes great enough to entirely eliminate all of the initial stress, we will have the fact called to our attention by a leaky joint.

In the foregoing exposition of the conditions I have considered the shell as long as the bolt. In actual practice the thickness of the gasket is small compared with the length of the bolt; but it is also more easily strained; that is, its coefficient of elasticity is less, and we probably would have to increase the strain in the bolt as much or more than we would under our assumptions before having a leaky joint.

Why the Spring Assumption Is Wrong

From consideration of the above facts it is easily seen why, by assuming the introduction of springs in place of the gasket, the final stress becomes the sum of the initial and that caused by internal pressure; and by introducing a spring balance in place of the bolt, the final stress becomes that caused by internal pressure alone. The reason in the first case is that the increase in strain in the bolt caused by the internal pressure, reduces the initial strain of the spring by such a small amount that the spring continues to exert the force due to the initial strain. If we introduce a spring for a bolt, any slight increase in the stress causes a large increase in the strain when compared with the increase in strain this same stress would cause in the bolt. Hence, for a small increase in stress as shown by a spring balance, we have a leaky joint.

The introduction of springs into this problem changes the conditions entirely, and the conclusions arrived at when they are introduced, if applied to the actual case, are wrong. The only way to understand the problem is through the understanding of the fact that stress and strain cannot be separated. When this fact is fully comprehended there will be no difficulty with such problems as this.

Blue Finish for Plyers

The halftone shows the outfit for bluing pliers in use in the shop of the Utica Drop Forge and Tool Company, Utica, N. Y. The furnace *A* uses gas for fuel. It is provided with a cast-iron pot about 14 inches diameter by about the same depth. Ten parts of niter to one part of black oxide of manganese are melted and stirred together in it. Usually this bluing compound is only heated till it will set dry-pine sawdust on fire, but it has been found by the superintendent, Mr. Kelleman, that better results can be obtained by heating to a dull red.

Outfit for Putting Blue Finish on Plyers

The polished plyers are placed in the basket *B* and lowered into the hot compound. The time of immersion varies for the different sizes from about a minute to two or three minutes. The basket has holes in it so that the compound drains off when it is removed from the pot. The basket is then lowered into the tank *C* of clean water, being dipped and taken out and dipped again. The result is the fine blue finish found on the Utica plyers.

Lubrication of Ball Bearings

By Victor W. Page *

The importance of lubrication in ball bearings considered from various viewpoints.

Some simple tests to determine suitability of lubricant for various types of accurate bearings.

*Mechanical engineer, New Departure Manufacturing Company.

The conditions under which a ball bearing of the annular type operates are radically different from those which obtain in plain journals, and the superior efficiency of the bearings in which balls are utilized to support the load is due to a point contact instead of utilizing the greater areas which obtain on brasses which partly or completely encircle the shaft and have a correspondingly augmented friction. The requirements call for extreme accuracy of manufacture and the successful ball bearings are machined to the very close limits of 0.0001 of an inch. This micrometrical unit means but little to the average layman and there is no general conception of the care necessary to work to the close limits established. When one considers that this extremely small part of an inch is about one-twentieth of the thickness of a human hair, the difficulties that beset those who are endeavoring to work to this close limit and turn out large quantities of work in a commercial manner can be better appreciated.

Bearings, of the leading makes, sometimes fail in service, and the motorist or average dealer, ever ready to condemn that which he does not fully understand, attributes the cause of failure to careless workmanship or the use of poor materials on the part of the producer, whereas the trouble is often due to conditions which are entirely within the motorist's control. A ball bearing must have a certain amount of running clearance, but in the leading types this is much less than in a plain bearing, it being common practice to allow a radial freedom never greater than 0.001 inch.

Many cases of trouble in rear-axle and transmission-case bearings have been definitely ascribed to the presence of minute particles of metal ground off from the gears or sand loosened from the interior of the gear-case or rear-axle housing castings. In sliding gears, especially when operated by an inexperienced person, there is a constant clashing of the pinions in changing speed which tends to loosen particles of metal from the teeth. These fall into the lubricant and ofttimes find their way into the ball races. The rapid failure of the bearing is the inevitable consequence. It is my opinion that many cases of ball-bearing failure in automobile engines, when used to support the crank shafts, have been due to the presence of particles of carbon and other foreign matter in the oil rather than to any structural defect. The importance of proper mounting has been so firmly impressed upon the automobile manufacturers that but little difficulty obtains in cars of reputable makers from improper installation, so we are forced to look elsewhere for the trouble.

There are two things, however, that are beyond the control of manufacturers of either the bearings or the mechanisms to which they are fitted, and they are the use of impure oils and carelessness in washing the automobile. Many cases of failure of wheel bearings have been directly traced to rust caused by the indiscriminate application of a stream of water at 40 or 50 pounds per square inch pressure, which is not uncommon in many city water mains, to the parts of the car in which they are mounted. The water finds its way into the bearings, causes the highly finished surfaces of the balls and races to rust, and the extreme accuracy in manufacturing and the care in installing will not prevent the rapid breaking down of the bearings.

That rust is absolutely destructive to ball bearings has been thoroughly proved in so many instances that the contention cannot be questioned. Of what value is extreme accuracy of finish of the balls to 0.0001 of an inch if the advantages accruing are to be lost by deposits of rust of much greater thickness than the limit established in manufacturing? Such a condition can be as easily recognized by the novice as by the expert, for even if the bearing has been cleansed so that no ferric oxide is visible to the eye, there will be a number of pits or depressions on the various parts of the bearings, especially at the highly finished ball surfaces. While these minute irregularities are sometimes caused by overloading and the flaking off of the metal which results from this condition, if due to causes other than rust and acid they would be confined to the ball tracks, whereas excoriations resulting from chemical action will be in evidence on all parts of the bearing.

It is a known fact that many oils and greases contain acids or alkalis, either as a necessary component of their composition (as in some animal fats that contain stearic acid); as a part of some filler used to adulterate the oil or alter its viscosity, and sometimes as a residue of some of the processes of purifying that obtain in refining from the crude product. The presence of acids in lubricants will cause an etching with irregular edges in contrast to the clearly defined rust marks.

The question of the effect of acid and rust on ball bearings has been discussed before in the columns of the technical press, but even at this time many motorists do not realize the importance of using absolutely pure ingredients for lubrication purposes.

It is very difficult for one who is not familiar with chemistry to determine if an oil or grease contains deleterious substances, and there is also considerable difference of opinion among authorities as to what constitutes a good lubricant for ball bearings. Lubricants vary in viscosity from light spindle oils to heavy greases, depending upon the nature of the bearing, the speed it runs at and the nature of the work it is called upon to perform. As a general rule, too heavy greases are to be avoided, as these often contain vegetable and animal fillers, and even if pure mineral products, they will not fill the interstices between the balls and the separators as will lighter oils that flow more readily.

High speeds demand lubricants of lesser viscosity, low speeds and heavy loads require greases as heavy as is possible to feed to the bearings. There has been a general misconception on the part of many motorists, this having been encouraged by dealers and others who should know better, that bearings of the anti-friction type, including all types of annular ball and roller forms need very little lubrication and demand no attention after once being installed. While bearings in this classification demand less attention than plain journals, it will be evident upon careful consideration that they should be examined from time to time to ascertain that they are clean and that the lubricant employed is free from impurities.

As an aid to motorists, I will detail some simple tests that can be used to determine the suitability of the lubricant to any type of bearing where accuracy and absolute truth of the surfaces is an important factor in securing efficiency and endurance. The simplest test for acid is to soak a piece of cotton candle wicking in the suspected oil, wrap it around a brightly polished piece of steel shafting, and put it in a place exposed to the sun. If the surfaces covered by the wicking are etched after 24 hours, it is a good indication that the lubricant has some acid in its composition, or that there is an alkali present, and conse-

quently the oil is not suited for ball bearings.

The following test is also easily carried out: Procure from any druggist a solution of sodium carbonate in water, equal parts by weight. Take a small quantity of the oil to be tested and an equal amount of the sodium solution. Place them in a bottle or test tube and shake well, allowing the mixture to stand. If there is any acid present it will settle to the bottom as a precipitate and the amount of the deposit will then furnish some indication of the quantity of acid in the oil.

Another test for acid is: Dissolve a small quantity, say a teaspoonful of the oil or grease in five or six times its bulk of boiling water and while the oil will not mix with the water, any acid present will form a solution with it. A piece of red litmus paper is then placed in the liquid, and if it remains red after soaking for some time there is acid present. If the color of the paper quickly changes to a blue or purple, the oil contains an alkali, and if it changes to a pink very gradually, the oil is neutral. This test can also be made with a piece of blue litmus paper which will quickly turn red if any acid is present, though it gradually assumes a purple hue if the oil is neutral.

Many animal fats contain acids as one of the constituent elements and this substance is generally in grease made from a tallow or "filled" with some oil of other than mineral derivation. Others are thickened with vegetable oils. To test for either of these in an oil that is represented as a pure mineral product, the saponification test may be tried. Place five or six ounces of the suspected lubricant in a sauce pan and add one or two ounces of caustic soda or concentrated lye. Boil the mixture for 15 or 20 minutes and set it aside to cool. A tablespoonful of common salt thrown into the mixture while it is solidifying will hasten the process in many instances. When cold, examine the compound; if the surface is covered with soap the oil contains animal or vegetable fat, if not, it is a pure mineral substance.

Many motorists may question the value of such tests and may feel that it is not worth while to make any one of the simple experiments detailed, to see if the oil used is at fault. Ball bearings are expensive, however, and as no manufacturer will replace those that have failed because of chemical action caused by water, acids or alkalis, it behooves the motorist to ascertain definitely if the lubricant he is using is suitable for the purpose and not depend upon the word of a more or less interested dealer who may sell inferior oils because of the greater profits.

Another point I wish to criticize is the common method of cleaning ball bearings in the average motor-car repair shop. The bearings are dipped in dirty gasolene, in which old gears and other parts have been previously cleansed, and this material is full of metallic particles as soon as it is stirred up enough to disturb the sediment, so instead of cleaning the bearing it fills it with deleterious substances. A simple solution of common washing soda and hot water for cleansing greasy parts and assembled bearings at the completion of the manufacturing process offers important advantages. It can be easily made by taking about a handful of soda to the pail of boiling water.

The bearings are placed in a wire basket or hung on a wire and dipped in this water a few times to remove all dirt, then they are immersed in clean kerosene and given a swirling motion to have this material thoroughly clear out all traces of the soda. The bearings should not be allowed to remain in the alkaline solution more than a few seconds at the most, and a few dippings are all that is necessary to clean them thoroughly and cut all the hard and rancid grease or remove any metallic dust present. On examination of used parts, if the bearings are clean, the surfaces bright and they are not too loose, they are in good condition.

A good lubricant for bearings is a slush made of pure vaseline and lighter mineral oil, this being heated to make its viscosity less and enable it to penetrate all parts of the bearings, no matter how minute the spaces. When the bearing has been dipped in this and allowed to remain long enough for the oil to reach all parts, it is taken out and allowed to cool, and the surplus lubricant is wiped off. Such a mixture will stay in place, and will not run out like lighter oils and at the same time its viscosity is not so high that it will produce unnecessary friction.

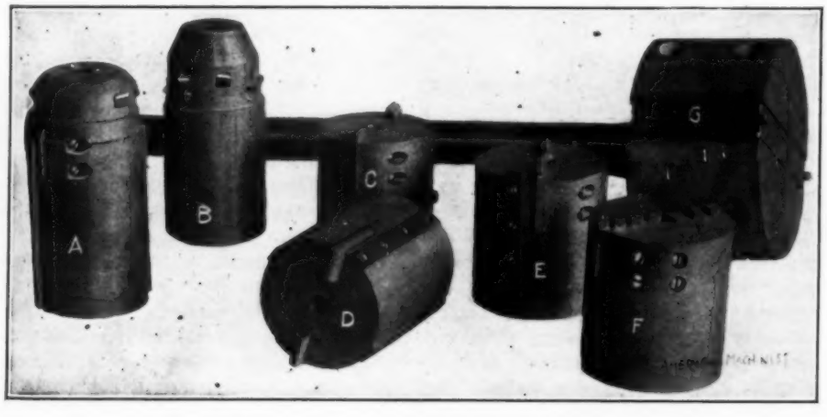
Some Cylinder Boring Tools

The halftone shows a few boring and reaming tools made by the Binsse Machine Company, Newark, N. J., for use on their horizontal boring machines while machining out engine cylinders. *B, C* and *F* are roughing tools for different jobs, while *A, D* and *E* are finishing tools or reamers. *A* and *B* are used for cylinders with a small chamber in the end, while the others are for square-bottomed cylinders.

A point worth noting is the way strips of fiber are set into the sides of the finishing tools to guide and steady the reaming blades.

A large reamer for finishing cylinders 8x24 inches, is shown at *G*. This has turned wood blocks bolted to the head for steady guides and the beautiful finish it leaves on the interior of a cast-iron cylinder, is a revelation to those unused to these tools. The cutting or reaming blades, two in number, are set into taper grooves, so that as they wear they may be again brought to size or reground, by tapping them forward with a hammer.

Hollow grooves are cut into the head parallel with and close to the blades, so that any tendency to loosen can be corrected by peening the metal up to them with a flat round-nosed punch.



CYLINDER-BORING AND REAMING TOOLS

While we are talking about conserving natural resources, it is well to consider a few other things which should be conserved both for the actual saving in cash and the example it sets to others. Take, for example, a set of invitation cards to a convention to discuss industrial accidents, compensation, pensions, etc.—all conservation subjects—and we find a set of six beautifully engraved cards and an elaborate program in a heavy envelop requiring six cents in postage—representing a direct waste in both printing and postage.

No one dislikes poor, cheap printing any more than we do, but on the other hand it is just as much a waste of resources to squander money on useless elegance in stationery and programs as in any other way, and the example is bad. The money wasted in this way could be used to far better advantage in setting forth the merits of the various causes under discussion.

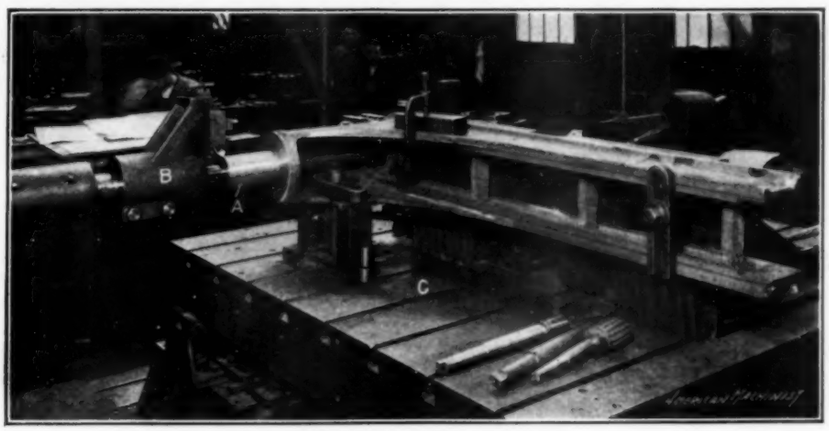
Letters from Practical Men

Concerning the details of making things in machine shops, from the first sketch to the shipping room. A letter good enough to print will be paid for. The value is in the idea—not the length of the letter

Machining a Trunnion

The halftone shows the machining of the trunnion *A* of a Detrick & Harvey radial-drill arm. The machine used is a Detrick & Harvey horizontal driller. The arm is first planed and then set square with the table *C*, which it itself set square with the spindle of the machine by means of a tram held in the spindle.

The hole through the trunnion is first bored and reamed to size, then a ground bar fitting the hole is mounted in the spindle of the boring machine. The external turning head *B* is mounted on the outside of the spindle and the trunnion is turned to size. The head *B* is provided with star feed for facing the flange.



MACHINING A TRUNNION

New York City. E. A. DIXIE.

Training the Power of Observation

In connection with machine drawing, at the Worcester Polytechnic Institute, we have this year introduced a line of work by means of which we hope to improve that most neglected faculty in the training of students of engineering; namely, observation. Each year students go out from our engineering schools and are made the butt of jokes because they know little or nothing concerning the simple things of machine construction. They can tell you to a nicety how strong a certain piece of a machine should be, if they are furnished the data upon which to base their estimates, but if turned loose without these data, will, in many instances, furnish some very crude construction. This lack of knowledge is not, in a certain sense, their own fault, for the machine details and their relation to each other have not been brought to their notice. Many schools, to be sure, give a splendid course in shop work, and some of the students, upon the completion of this course are well fitted to hold their own in the machine shop. However, when it comes to the machines themselves and the principles upon which they are constructed, exact knowledge concerning them is lacking.

The student's tendency is to confine himself to the work that is laid out for him. He is very immature and naturally tends to confine his work to those things, only, toward which his mind is directed. His course of study is rather full and when he is not busy with his regular curriculum he would much rather spend his time dreaming of his best girl, engaging in athletics, or in some other manner many times less commendable than either. Not that there is any objection to sports or best girls; both are all right in their places, but it is to time that can be spent to advantage when not engaged in either pastime that I refer.

A FEW ILLUSTRATIONS

Certain principles involved in the construction of machines can be observed while working with them and these principles so fixed in the mind that use can be made of them in many places in drawing and design. Let us take one or two concrete illustrations of the things to which we refer. Consider for the moment a simple detail, such as the ball and crank handle as used on the apron of some engine lathes for running it along the bed. A number of good thoughts enter into its design which involve little calculation, but much good judgment. In the design of this crank and handle, the MAN element must be considered; that is, the designer must remember that it may be used by a reckless boy or man who is liable to jerk things and jack them into shape when everything does not go to his liking. It must therefore be made sufficiently strong to resist these fits of anger. Other things of equal importance are appearance, balance, size of handhold, which must be made sufficiently large to afford a comfortable grip; method of fastening handle into ball and method of fastening handle to stud. The handle must not be made of such a size as to detract from the symmetrical appearance of the entire apron. In fastening the handle to the ball it must be determined as to whether to screw it in or make it a driving fit. If screwed in, provision must be made to prevent its turning out. In fastening to the stud the handle must not bind, therefore, the stud should be made smaller where it passes through the ball. Furthermore, the crank must be pinned or keyed to the stud and it is also desirable to make the threaded portion even smaller, in order that a smaller nut may be used, thereby adding to the general appearance.

Let us consider another machine detail, for instance, the cross rail of a planer. In its design are found a number of principles of general utility, a few of which are method of raising and lowering, method of attachment to housings, fastening of head to cross rail, and use of strengthening ribs for the middle portion of rail between housings.

In a similar manner at different times parts of machine tools have been considered—such as the platen and bed of a planer, with method of lubrication of contact surface, compound rest of a lathe, miller knee, sliding head of a driller, driller table together with the method of raising and lowering it. In each case the student has not been previously informed concerning what detail to expect but has been told upon what machine the test would be given. The time allowed for the sketches has been from fifteen to

thirty minutes. Afterward, we have taken up the detail in the class room and discussed the possibilities entering into the design. We have found that the student has shown a marked improvement in his discernment of the relation of parts and of their proportions. Every designer and engineer must have a knowledge of certain details and principles so fixed in his mind that he can reproduce them at any time, in different form, and it is our hope to get the student started along a line of observation for himself. Some definite measurements must be remembered as a means of comparison when making new layouts. Relation of parts of machines must be remembered and the similarity of corresponding parts in different places. It is not necessary to confine these observations to one line of work but the range may be extended to a broad field. We have, however, confined ourselves to machine tools because of the short time that is given to the work and the great number of possibilities of design that can be found therein.

JAMES C. DAVIES.

Worcester, Mass.

Ideal Catalogs and System for Filing

It is hardly necessary to define the word system other than to give the definition "an orderly combination or arrangement"; and this is to be the theme of this article.

I was brought up by system and have been privileged to revel in it as a workman in the machine shops, as a clerk, and as an executive, but only recently have I come in contact with the buying end of the machine-tool business and am consequently more or less dependent upon catalogs and circulars for information regarding manufacturers and particular products. For the benefit of those similarly situated, I give my views on the subject of machine-tool catalogs and the system of taking care of them, trusting that the manufacturer also may find something in the article to his advantage and profit.

I find that all sorts and conditions of catalogs and circulars are issued, some of them works of art, and others not so beautiful; some as large as 10 by 14 and 4 inches thick and some simply a small circular 3x6 inches, and any old size between these extremes, seemingly at the will and whim of the printer.

I am convinced that the primary object of the manufacturer is not only to get his products before the consumer but what is more to the point, to keep them there; therefore, catalogs should not be printed and distributed haphazard but with this object in mind, and every effort should be made to induce the buyer to keep and file these advertisements in a systematic and orderly manner.

The present sizes of catalogs and circulars differ so greatly that it is not convenient to handle and file them, and many are either misplaced or thrown away.

It is interesting to note that a large number of manufacturers are conforming to and sending out catalogs and circulars of the standard size (6x9 inches) recommended by the Machine Tool Builders Association, but others are giving this important part of their business no consideration whatever. The standard size, 6x9 inches, is neat in appearance, convenient to handle and easy to file.

Another great source of vexation to the buyer who is seeking the latest products is the absence of the date of issue of catalog or circular, and it is deplorable that in so many instances, the date is omitted, and one can but guess whether he is uptodate or ten years behind. If catalogs were dated, the buyer would be more apt to keep in touch with the seller and when a catalog is three or four years old would request another and later issue, whereas now the buyer is often misled, believing the machine illustrated is the improved product.

It is conceded that the making, printing and sending out of a new complete catalog often enough to keep uptodate, is a most expensive proposition and there must of necessity be simply circulars describing some particular tool or machine desirable to exploit and place upon the market. Very well, then why not issue catalogs in the form of bulletins? Let the first issue be contained in a neat binder conforming to the standard 6x9 inches and then put out new stuff in the form of bulletins also 6x9 inches and if the tool or machine to which attention is directed is an improvement and to take the place of a machine already cataloged, say, "Bulletin No. 62, supersedes Bulletin No. 49," or if the bulletin contains something entirely new, it should be so stated. These bulletins should be dated and numbered consecutively. Adherence to this plan would be desirable and the buyer would always have the latest information without the necessity of keeping superseded stuff and cluttering up his files and records with dead matter.

Mr. Buyer, how do you keep your catalogs? Do you throw them into a closet or drawer to be pawed over and over, and, while you are seeking something you cannot find, you are losing patience, time and money?

We should be fair to the manufacturer and to ourselves; the manufacturer has spent considerable money to produce these catalogs for our information and we should keep them carefully in proper files for quick reference.

The ideal filing cabinet that I have in mind contains about 900 catalogs and circulars of different manufacturers and dealers, and these refer to more than 350 different articles, and is a rack or book case having shelves lettered *A, B, C, D,* etc., and these shelves divided into compartments from 3 inches to 5 inches wide, numbered 1, 2, 3, 4, etc. The catalogs should be plainly marked, preferably in the upper right-hand corner, with the letter of shelf and the number of the compartment on that shelf; namely, *C* 1.

Having a filing cabinet, we should now prepare a card index, two of them in fact, one for the name of the manufacturer or dealer and one for the article manufactured.

Inasmuch as a catalog may relate to more than one subject no attempt should be made to segregate lathes under lathes, planers under planers, etc., for, by means of the card record any catalog on any subject can almost instantly be located; for instance, one card index takes care of the manufacturer or dealer, and should a catalog of John Jones Company be required, reference to the index indicates John Jones Company *C* 1, meaning that their catalog is in section *C*, compartment 1. The cross record of subject index is particularly useful. It is impossible, to retain in the memory the manufacturer of any particular machine, tool or device, and just here this subject index is most helpful. Should the subject under consideration be lathes, reference to the index indicates all catalogs there are on that subject, and should the desired lathe be hand, engine, speed or what not, the record will plainly show, as all the subjects are subdivided.

In the selection of a machine tool one is often at a loss to know the most desirable and for the purpose of comparison several makes should be considered. The subject index is helpful at this time too and will indicate everything you have on that subject.

LYMAN B. THOMPSON.

Schenectady, N. Y.

It is interesting to note, in connection with the universal movement toward the prevention of industrial accidents, the following rules issued by the Allegemeine Elektricitats Gesellschaft, Berlin, Germany, for the guidance of the employees in the operation of milling machines and circular saws: 1. All fast-running mills and saws must be surrounded with protecting caps. 2. Special care is to2 be taken that the stresses on saws and mills are exactly central, or in the plane of the cutter. 3. Damaged or sprung cutters are to be replaced immediately. 4. Small pieces to be cut must be fastened in holders and jigs; cutting of small pieces held in the hand is forbidden, under all conditions. 5. The chips which are thrown off are to be taken out by means of sheet-metal dippers or similar apparatus. 6. The wiping off of chips in front of the mill or saw is only to be undertaken with brooms or by brushes such as are supplied for this purpose.

Discussion of Previous Question

Letters from our readers showing how many men of many minds look upon various subjects opened up in previous numbers

Removing a Crosshead from a Piston Rod

Referring to the article by R. C. Mitchell, on page 217, he is to be commended for his resourcefulness in getting that obstinate crosshead off its rod. Having lived with steam engines for a greater part of my life, I am rather familiar with what can be done, toward dismantling them quickly in case of a breakdown, when steam is at hand on the boiler, and having been told off, scores of times, to see to an engine which required overhauling. I have managed to be on the scene as quickly as possible and before any steam connections had been broken; in fact, that point is one of the essentials of the efficient execution of a repair job; viz., that the man responsible for the repairs should see everything undisturbed.

Having arrived, and finding that the piston required to be drawn from the cylinder and the rod from the crosshead, it is simply necessary to bar the engine around so that the crank pin is on its outer dead center, then to knock the cotter out of the crosshead and rod, and to slip the cotter loosely in again; let a whiff of steam into the cylinders and there is the means at hand of drawing the piston from its conical hole in the crosshead, while it is prevented from being propelled too far by the cotter loosely fitting its ways.

To get the crosshead free of the rod entirely, the operator should bar the engine around to its inside center, and then reverse; when the piston will be at the end of the cylinder ready for withdrawal and the crosshead entirely clear. So much for the crosshead; a matter of one hour's work on a big engine.

The cylinder covers may be taken off in a similar way, i.e., by the use of steam as a means-at-hand. The crank being on its inner center, and the nuts of the cover studs slacked back (about one turn), a little steam may be admitted to the cylinder when the cover will gently come out. There is no pushing of wedges into the joint of cover and cylinder, and no broken covers this way, "and all is safe as houses"; just a little discretion is necessary.

I once found the means-at-hand of great service, in removing the trip from the piston rod of a large steam hammer. I had sent a gang of men to the job, and they had had flames applied to the top all day and had made no impression. As they heated the trip, the rod was heated and both swelled together. An infinitely quicker accession of heat to the trip was necessary; and as they were casting in the foundry, and hot metal was the stuff I wanted, a square box was made, bottomed and lined with sand, leaving a space all around the top for the metal to be poured in. Provision was also made so that the trip could only fall a certain distance on being released by the heat, while the box could be allowed to fall away from the trip as soon as it was off the rod. The metal was poured in the box of sand and the trip immediately fell off; the box was lowered (and with it, the molten iron) free of the trip, and thanks to the precision with which the details were carried out, the job was a perfect success.

Loram, Eng. J. T. TOWLSON.

Cutting Speed of Planer Tools

Regarding your short article on page 886, it is our shop practice to rough plane lathe carriages at about 55 feet and finish at about 35 feet. The beds we plane just a little bit slower. Our experience seems to bear out the statement that short work such as carriages, are planed noticeably faster than long work as with lathe beds.

Our planer foreman states that with one planer working on carriage and another on beds, both at the same speed, both taking the same depth of cut and with the same tool steel, the tool which is cutting the beds will burn out considerably quicker. His theory is, that when planing a string of carriages the intermittent cutting gives the tool a short rest, and some chance to cool. On the other hand, he claims that the shock of the tool entering the work has no harmful effect.

Cincinnati, O. H. M. WOOD.
Lodge & Shipley Machine Tool Company.

How Would You Perforate These Sheets?

Replying to Roy's query, on page 747, regarding the perforation of leaded-steel sheets, I would suggest that he observe the following precautions, in order to avoid the breaking of punches.

First, for the thickness of steel specified (0.065 inch), the holes in the die should be not less than 0.004 inch larger than the punches. Attention to this point may solve the difficulty, if not, then it may be that the automatic feed is to blame. It may move the stock after the punches are entered or before they are clear.

It is desirable, anyway, to release the hold of the feeding device just before the punches strike, as this allows for any buckle in the strip and any spreading due to the piercing.

The punches should not be more than eight diameters long; if longer, they should be made larger in diameter at the back or supported by a sleeve to within that distance of the cutting edge. They should also be supported and guided by hardened bushings in the stripper which I assume is screwed and doweled to the die.

To further avoid the breaking of punches it is necessary that the stripper get a flat bearing on the stock, which must not bind at the edges.

While the holes ⅛ inch are small for the stock, they are not so small as to make frequently broken punches inevitable as I have pierced 0.172-inch holes through four superimposed thicknesses of steel (0.036 inch) making a thickness of 0.144 inch, as a regular thing. Before I accomplished it I found it necessary to reduce the speed of the press in which the tools were used, and maintain its power by adding weight to the flywheel. Something in this direction may help Roy out of his trouble.

I doubt whether the arrangement of the punches has any bearing on the breakage; that is if there are only perforating punches in the holder, and no blanking or parting punches.

Regarding the rotary method, if Roy means passing the strips between two rollers armed with punches and dies, it would be impracticable in my opinion on account of the material he is using and the relative size of the punches.

Petersboro, Ont., Can. M. H. P. A.

Graduating a Scale on the Miller

Mr. Rantsch, on page 699, in reply to my criticism of his method of graduating a scale on the miller, states that if he used the index crank handle he would simply revolve the spindle of the dividing head and not advance the screw.

In writing I assumed that Mr. Rantsch was familiar with the attachment used for milling short lead spirals. This attach-

ment fits the spindle of dividing head and projects through the back so that it can be geared to the screw of the miller. If he puts the gear he is using on the worm shaft on this spindle, and uses a suitable idler he can advance the screw as in his original method.

Brooklyn, N. Y. G. W. A.

Cadillac Screw Threads

On page 604 appears a comparison of the Cadillac form of thread with the United States Standard form, written by J. E Winter, of Winter Brothers Company, Wrentham, Mass., tap and die makers.

This latter article was in reply to my own article on page 211 entitled "Merits of Cadillac Form of Thread;" but Mr. Winter could not have read my contribution very carefully, or he forgot the context when he came to write; for there are several misquotations, and some places where Mr. Winter says things that are not exact statements of fact. One assertion he makes he must prove, to be believed by any practical toolmaker.

In the very beginning of his article is shown the commercialism which prevails in the entire piece. When Mr. Winter says my article "might cause many to have a poor opinion of the U. S. Standard form of thread and to retard the adoption of this form of thread in some places," he speaks from the standpoint of the tap and diemaker with his tools all made, ready and in good trim to quote prices on *his* rendition of this standard.

On page 211, speaking of the U. S. Standard form of thread it was said: "In producing this thread, *if the form is adhered to in the male and female,* it necessitates a fit not only along the angle of the thread, but also on the flat at the top and bottom." This is somewhat different from Mr. Winter's quotation and, furthermore, it is a fact. Conversation with old pioneers of the thread problem brings out the fact that it is not definitely known what the original intention was.

While agreeing with Mr. Winter that "it seems scarcely possible that anyone could consider such a proposition," all the same, resting in my office desk are several U. S. Standard taps and dies made by a most reputable firm, which adheres to the form in a manner most truly remarkable. Did they strive for a fit on the flat? In this same desk are some others made by a firm that is famous and the outside diameters of the threads in the dies are 0.003 inch larger than the outside diameter of the taps of the same size. This is another interpretation by the tap and diemakers of this standard. These constitute but a small part of our collection, all of which tends to prove that when you buy a U. S. Standard tap or die you don't know what you may get, and as the article on page 211 says, "we believe it is a mistake to outline a theoretical proposition .... and then leave it to the good or bad judgment or caprice of the individual to adapt it in a manner most pleasing to himself."

Now, the statement that the Cadillac company started out with V-thread taps of a certain make is not a fact. Mr. Winter's information in this respect is not correct; but there would have been very little difference as far as any consistency in size is concerned, if they had, as he so clearly proves in speaking of the varying V-thread standards. However, having originally adopted a V-standard, of course nothing else could be done but perpetuate the pitch diameter. The same thing would have occurred had it been the U. S. Standard, so this talk about the Cadillac thread being good only for the Cadillac company, or for firms that originally started with a V-thread, is all wrong. On account of the interchangeability of parts, the pitch diameter must be maintained no matter how, or with what, you start. This is why it seems that Mr. Winter must have read the article very carelessly. Not a word is said in it, anywhere, that would lead a thoughtful man to suppose it was maintained for an instant that it would be well to adopt the Cadillac thread as regards size; but it is maintained that its form has them all beaten in all cases where the V or a U. S Standard is applicable, because its rules are simple and uniform. There is absolutely no danger of a conflict at top or bottom of thread and also a system of test tools can be easily established, whereby threads are known to be tested easily and quickly *on the angle* and, last but not least, because one is not obliged to rely upon the judgment, good, bad or indifferent, of any individual.

To be sure, there were tables printed; but this was done merely to show how the thread worked out in various ways. It was not supposed that anyone, after reading the article, would apply this in any other manner.

The inconsistent part of Mr. Winter's article is his defense of the U. S. Standard form of thread and how he immediately proceeds to destroy it in his factory, according to *his* ideas; which, by the way, if one intends to use this standard, is a very fine adaptation. But, as has been shown, all tap and diemakers cannot be so relied upon; and again, just the moment you begin to increase the outside diameter of the U. S. Standard thread for clearance, the form is not only lost, but the correctness and necessity of the Cadillac form of thread is admitted in principle, although the benefit of its simple rules of clearance is lost.

Another point in Mr. Winter's article is that he overlooked the fact the Cadillac thread does not call for a sharp ("razor edge") V-form in either tap or die, but what might be termed a modified V-form, as 0.005 inch on the diameter is allowed on all sizes and pitches.

The part of Mr. Winter's article that one would like to see him prove is that a very sharp-pointed V-thread tap or die can be hardened with no injury whatever to this "razor edge."

As regards his objection to the Cadillac adaptation of the A. S. M. E. standard, in which he points out the apparent conflict between the minimum screw size and the minimum tap size, it is now seen that this point was not made as clear as it should have been in my article; but with the test tools made according to the system in operation in the Cadillac plant, there is absolutely no conflict whatever. This is a long subject, but it seems sufficient to say that this method of overcoming the conflict of limits in pitch diameter was obviously the best way, in view of the fact that the tap and die makers unanimously refuse to work to close limits, at commercial prices.

There is, as Mr. Winter says, an occasional necessity for departing from any rule or standard that might be established; but would it not be better, instead of trying to cover these by a "variable" standard, as he suggests, to treat them as special, and handle them as such with proper tools and gages?

G. A. Gulowsen, on page 556, seems to agree with the rest of the critics in the acknowledgment of the benefits to be derived from the use of the Cadillac form of thread; the only thing that seems to bother him is that someone else, A. W. Browne, developed the identical thing a long, long time ago, and he does not wish to have it called the Cadillac thread. Well, this may be so, its possibility or even its probability is not denied; for people who have lived and written many years ago, like Joshua Rose, for example, advocated a clearance at top and bottom of thread, and Mr. Gulowsen must also be a careless reader or he would have noticed that nothing new has been claimed in principle. The only thing believed to be a new feature is the set of specific rules that govern this clearance.

Really it wasn't the Cadillac company at all that started to call it the "Cadillac" thread; but the tap and diemakers and the die-head men gave it this name, and naturally so because of the peculiar specifications in ordering.

The last clause of Mr. Gulowsen's article is a misconception. This will correct it: Below 5/16 inch, the Cadillac company uses A. S. M E. commercial taps and makes its own screws according to the adaptation published. For 5/16 inch and above, the Cadillac thread is used.

Detroit, Mich. A. D. Elmer.

The Shore Optical Pyrometer

By Thomas L. Morely

Pyrometers of the optical type, which operate by means of heat rays transmitted from the incandescent object, are very interesting in that they utilize principles in the science of optics which are valuable, although almost invariably very costly. An instrument working on this principle, and designed to overcome this objection is the pyroscope invented by A. F. Shore, of the Shore Instrument and Manufacturing Company, of New York

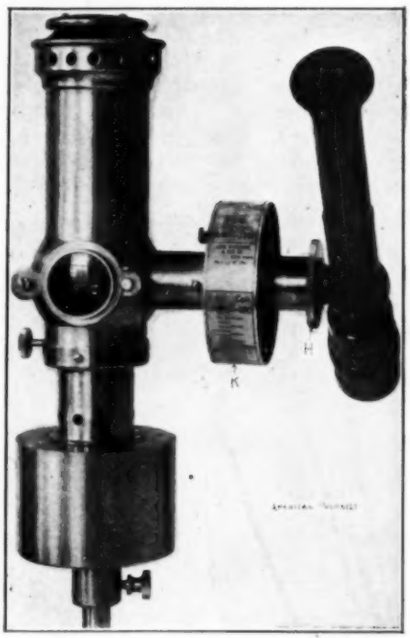


Fig. 1. The Shore Pyroscope

City. This instrument, here illustrated, while a fine optical contrivance, is simply constructed. Instead of carrying an electric lamp for a standard of comparison with the red heats of the hot metals, etc., this pyroscope has a simple kerosene flame of very small size.

Fig. 3 shows the optical principle employed, and in which *A* is the miniature kerosene flame, *B* is a condensing lens, *C* is a colored shutter diaphragm for changing the color of the flame to match the red heats ranging from 1200 to 2100

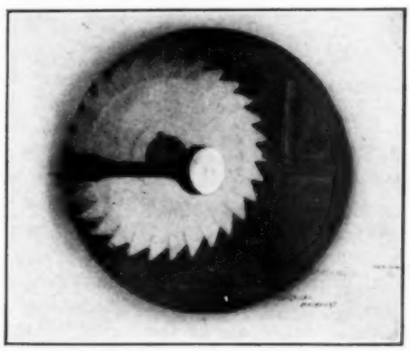


Fig. 2. Appearance of Work in the Eyepiece

degrees Fahrenheit. The synthetic light rays are thus focused on an intercepting screen *D*, which becomes illuminated. When now looking through the microscope eye-piece *E*, a clear picture of the oval disk of the speculum *F* is seen to be illuminated, while at the same time the work, consisting of heated steel or molten metal, is clearly seen through the wide-angle object glass *G*. Since the

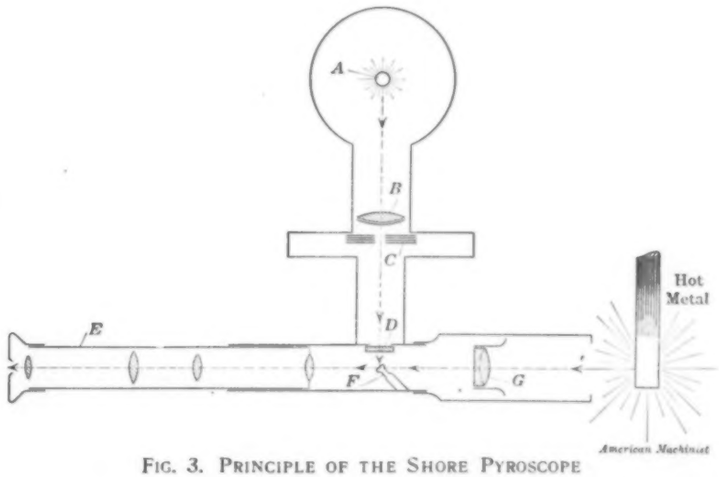


Fig. 3. Principle of the Shore Pyroscope

speculum is in the focal plane of the object lens, an optical illusion is produced which causes the illuminated disk to appear to lie flat on the work, no matter how far away it is. The appearance of this illumination is as shown in Fig. 2, where the speculum shows a higher illumination than the milling cutter and punch, thus showing that the temperature of the latter is lower. By now turning the knob *H*, Fig. 1, which actuates the shutter diaphragm, the light of the speculum may be adjusted to match exactly the intensity of the light given out by the work so that the unknown temperature can be found on the graduated drum *K*. Or the drum can be set to any temperature, allowing the heat of the work to come up to it so that it can be removed from the fire as soon as it reaches this point. Fig. 1 shows how the pyroscope looks ready for use; Fig. 4 shows how it is used in connection with an ordinary heating oven.

Advantages of Optical Device

With optical pyrometers it is not possible to measure temperatures closer than from five to ten degrees, while the electric pyrometer often can measure to within one degree Fahrenheit when perfectly calibrated but, as is well known, these instruments are constantly changing and it is therefore necessary to recalibrate them every now and then. An optical pyrometer on the other hand, having no materials exposed to disintegrating temperatures, is constant, and it is this element of reliability in the long run which makes it so valuable.

While the electrical pyrometer can successfully measure the temperature of an oven or bath, the optical pyrometer has the special advantage that the temperature of each piece can be measured in a furnace having a heat higher than the work and which is used to facilitate more rapid working; it will, of course, show also the temperature of the oven. Very often,

Fig. 4. Using the Pyroscope with a Gas Heating Furnace

however, small tools are heated merely in a gas blast for quick results. Here the optical pyrometer is the only known means for measuring the heat of work down to the size of a needle.

In many shops the open-forge charcoal fire is still in use and is giving good results. Here again the optical pyrometer alone can cope with the situation, so that results can be obtained as good as those possible in a heating oven. Likewise, rolling and forging heats can be measured only this way.

Machining Cams on a Planer

EDITORIAL CORRESPONDENCE

The Elyria Gas Power Company, Elyria, O., builds a great many large producer-gas engines ranging in size from 10 to 250 horsepower, and in consequence of the range in sizes, some of their manufacturing methods are necessarily flexible, and their fixture for machining cams on a planer, shown in Fig. 1, is a good example of a device that can be used for all sizes.

Eight to ten cams can be machined at once by using this device, a specially laid out cam being used as a guide at *A* where only a few of a kind are to be planed, but where a more commonly used type is run out, a finished and hardened cam is used in place of the laid out one at *A*, and the cutting tool is set to just clear it on each stroke, making the rest exact duplicates of the hardened one. In use, the cams are gradually rotated by turning the handle *B* of the worm, with one hand while the planer tool *C* is operated with the other.

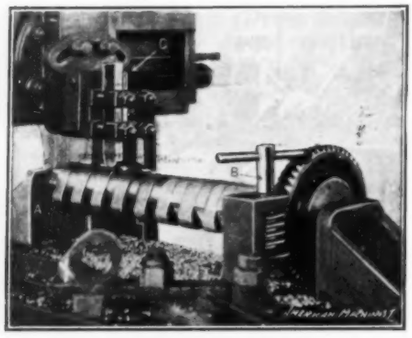


FIG. 1. FIXTURE USED FOR FINISHING CAMS ON A PLANER

Time is generally saved with a device of this kind by cutting the keyways after boring and turning, and then placing them on a keyed arbor as illustrated, as in this way any slip in the cutting of the keyway is corrected in planing, provided the pattern is correct.

Standard parts of one size are used for as many different sizes of engines as possible and in Fig. 2 are shown a number of jigs used for some of the parts. *A* is a jig for holding babbitted boxes while boring out on a lathe, the box being strapped to the angle by a U-bolt, the angle plate, of course, being bolted to the lathe faceplate; *B* is a drilling jig for an intermediate head; *C* jig for exhaust-valve cages; *D* governor-base jig; *E* igniter jig; *F* intermediate head; *G* cam lever; *H* piston-rod flange; *I* governor weight; *J* governor-weight lever; *K* bell crank and *L* exhaust-valve rocker jigs. Parts which are finished in the jigs are in each case shown in them.

The Prevention of Accidents Through Fire*

BY THOS. D. WEST

At no period of the country's history have there been a greater number of reforms carried out than in the last decade. Chief among these at the present moment is the struggle to safeguard life and property against the results from accidents. Among the many various accidents causing loss of life and property, there are none more to be feared than those from fire.

Foundrymen, as well as other employers, have to be on a continual lookout in this direction, for hundreds of thousands of dollars in damage, with occasional loss of life, can be directly traced to carelessness with fire. Buildings, patterns, and the equipment of many foundries have been lost, and firms entirely put out of business so often, that it would seem advisable to urge concerted action to do away with as much of this danger as may be possible. In these days of heavy and increasing accident and fire-insurance rates, it becomes a question of conserving our National resources by guarding every avenue leading to life and fire losses.

It is not the purpose to consider every factor entering into the causes of conflagrations, but to call attention to the careless use of burning matches and tobacco, as costing some fifty millions of dollars annually, not to speak of the lives sacrificed. If it were only the loss of property, we might continue to tolerate it on the supposition that it is unavoidable, but when we see almost daily, without a moment's warning, fine lives sacrificed, accompanied by horrible tortures of mind and body, a protest should go forth and steps be taken to minimize such awful risks.

The match as an originator of the damage stands unquestioned. The real reason for carelessness in its use lies in the lack of education of our youth to the responsibilities involved. Public toleration of throwing about lighted stumps, etc., on the part of children, and lighted matches, cigarettes, cigars and burning ashes of the pipe by grown up people who should know better, has brought things to such a pass that only the most vigorous action will awaken the public conscience to the consequences of the evil.

Similar indifference may be found in thousands of examples in our public buildings, factories, stores, shops and places of public amusement or meeting. When the same carelessness extends to powder magazines, and coal mines, then the public press has a new disaster to herald. Similarly the recent holocaust in New York City, caused by a cigarette stump which was still alight when thrown on the floor. What practical outcome from this lesson has there been so far? No one can more thoroughly advocate the provision of every possible safety device for saving human lives in cases of emergency, than the writer, but more is needed. Since no one knows when he may be in exactly the same position and lose his life without warning or chance to escape, it behooves everyone to take an active stand in the way of helping to bring about a reform along these lines.

As smoking is chiefly responsible for the careless use of matches, many firms are prohibiting the use of tobacco that way on their premises. This might be extended to compel the carrying of safety igniters, such as the German patent device, combined with a receptacle for burning tobacco ashes on the part of those who constantly use the weed. As smoking has become part of the life of some people, there is no reason why inventive genius should not devise safety igniters to dispense with matches and tinder boxes so compact and neat that smokers need not object to carrying them with their usual outfit.

It is to be hoped that the agitation of this important subject may lead to some substantial results in the way of saving life and property, and that foundrymen, as well as the general public, will awaken to their dutues in this regard.

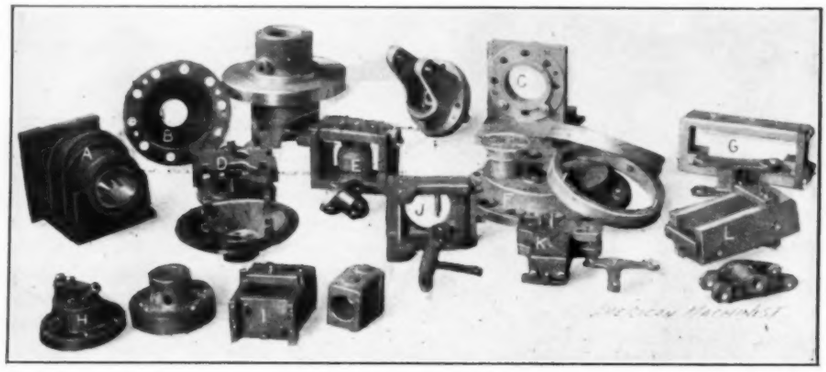


FIG. 2. JIGS USED FOR GAS-ENGINE PARTS

*Presented to the convention of the American Foundrymen's Association.

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American Machinist

Shop English

Whatever is worth doing at all is worth doing well. This applies as much to our speech and our writing as to the making of a jig; nevertheless, it is possible for a man whose English is susceptible of improvement to make a jig to a degree of perfection comparable with perfection of English of a college professor. Moreover, the mental qualities which a man must have to make a good jig are also such as would make the acquisition of a good knowledge of English entirely possible.

That the average shop man is able to use better English than he does is probably true and also that his habitual use of poor English is as much a pose and a fad as if he were one of the smart set aping a foreign swell.

The truth is that men are afraid to use correct English in the shop. They are afraid that their mates will think they are putting on airs and putting themselves above their companions.

It is unfortunate that this condition should exist, for it is one of the little things that, taken altogether, make the great obstacles to the social elevation of machinists. The transition of machinist to mechanical engineer is imperceptible from a mechanical point of view, but from a social point of view the gap is large.

It may be assumed that social advancement is a strong force, in fact, one of the strongest in the world, and that machinists are anxious to see their calling progress both as to income and social standing. One of the steps toward this advancement is the use of good, not stilted English.

Cutting Oil

Of all the dark and expensive mysteries surrounding the machine business there is none that is darker or more expensive than cutting oil.

Lard oil, once the standard cutting oil, is now so high in price that it can only be afforded by those doing the finest work. Most cutting oil is now made by mixing a quarter or even less portion of lard oil of a low grade with either a mineral or a vegetable oil. The mixture is sold on the professional basis, according to what the traffic will bear.

It would seem that some of our technical schools could do a great amount of good if they would make an exhaustive study of the problem, using different mixtures under different conditions and giving the results to the world at large so that each manufacturer could buy his oils and mix them to suit his needs as they might vary from time to time.

The remaining question would be that of the genuineness of the original oils. Whether enough lard oil and cotton-seed oil is used to fry doughnuts so that it could be bought under the pure food law or so that we might know if we were buying "oil, lard flavor," or not, is a question. Any light that can be brought to bear on this subject that would result in a lower price or better quality, or a differentiation of qualities for different purposes would be of great assistance.

Eye Accidents in the Shop

Every man who has been through the shop can vividly recall the many instances in which emery, steel, brass or other material made its way into the eye with more or less painful results. Many of us prided ourselves on our skill as "eye doctors" and have more than once performed the delicate operation of removing a firmly bedded piece from the eyeball with the blade of a pocket knife, without a tremor.

As with many other troubles we thought more of curing than of preventing them.

But the spreading movement toward conservation of all of nature's resources, is proving that eyes receive far too little attention in the shop and is unearthing some rather appalling information along this line.

One steel-working concern reports 95 eye accidents treated in its hospital in 78 working days, 5 of them resulting in loss of sight and several of a very serious nature. These are principally due to flying chips from machines and from the chipping hammer and chisel.

Brass turning, dry grinding and chipping are prolific sources of trouble. Tool guards, wet belts or exhaust fans, and attention to the heads of both hammer and chisel, will prevent much of this.

Every man can do much to lower the number of eye accidents both to himself and to his fellow workers. A leather or metal tool guard will help in lathe work, a chipping screen of cloth to prevent rebound of chips and care in keeping the head of the chisel ground to prevent the ragged edges due to upsetting or "mushrooming" will largely reduce eye accidents.

And lastly, the use of "goggles" to a much greater extent is to be commended. The locomotive engineer has taken the hint from the automobile driver and the shop man can well follow suit in many cases.

Short Convention Papers

In looking over the papers presented at the recent convention of the American Foundrymen's Association, we are struck by two things, first the large number presented—some 50—and second, their admirable shortness. Many are only from four to seven pages long, with here and there one running to 20 pages and a few somewhat longer. Too often convention papers are too few in number to cover the interests of all the members attending, and frequently they are so long that their presentation is tiresome to the audience and leaves insufficient time for discussion. But the secretary or meetings committee of the Foundrymen's Association has learned how to overcome both of these difficulties with the result, we doubt not, of increasing the interest of the convention to every attending member.

A New Means for Securing Foreign Trade

A new enterprise to secure foreign trade for American manufacturers has been launched under the name of the Allied Machinery Company of America. This is closely related to the National City Bank of New York, which gives it banking facilities in foreign countries that are of great value in any work of this kind.

Captain G. L. Carden, whose reports on machine-tool making in foreign countries have caused much favorable comment, has secured an extended leave of absence from the revenue cutter service and is now on his way abroad once more, accompanied by Samuel McRoberts, who is president of the new company and also a vice-president of the National City Bank. They have already arranged to take charge of the foreign sales of a large number of American machine manufacturers who expect to increase their business by this arrangement.

New Publications

HOMESTEAD, by Margaret F. Byington, 280 pages 6x9 inches. Published by the Charities Publication Committee, 105 East Twenty-second street, New York. Price $1.50 net, postage 20 cents extra.

This is one of the publications made possible by the Russell Sage Foundation, under whose auspices the investigations were made. The author is a trained worker along this line and takes up the various phases of life in a steel-mill town in an impartial manner, giving both sides of the matter equal attention.

The book shows in great detail, with many illustrations and tables, the people, the homes and the lives of the workers in the great steel-mill town, about two-thirds being foreign born and receiving such scant wages for the most part, that one can hardly understand the usual pre-election references to the highly paid American steel workers. It is a distinct contribution to industrial literature.

PRACTICAL ALLOYING, by John F. Buchanan. 205 6x9-inch pages; 41 illustrations in th text; indexed. The Penton Publishing Company, Cleveland. $2.50 postpaid.

The larger part of the material in this book was originally published in *The Foundry*. Those articles were so well received that their re-appearance in book form is a source of gratification. The work is a thorough and comprehensive treatise on alloying, with particular reference to the practical foundry side of the subject. There are 15 chapters with these headings: Metal Refining; History and Peculiarities of Alloys; Properties of Alloys; Difficulties of Alloying; Methods of Making Alloys; Color of Alloys; The Notation of Alloys; Standard Alloys; Foundry Mixture; White Metal; Solders, Novelty Metals, etc.; Fluxes for Alloys; Gates and Risers for Alloys; Crucibles; Testing Alloys. These are also six pages of useful tables, dealing with metals and their properties. In the machine-shop field the chapter on standard alloys will prove of value, particularly that section relating to alloys for bearing metals.

THE ELEMENTS OF GRAPHIC STATICS. By William L. Cathcart and J. Irvin Chaffee. 312 6x9-inch pages, with 159 illustrations. The D. Van Nostrand Company, New York. Price, $3.

Most books on graphic statics relate to civil engineering and architectural work; that is, primarily, the analysis of bridge and roof trusses. In the present volume those topics occupy but two chapters, the remainder of the book being devoted to a general treatment of graphic methods and to problems confronting the mechanical and marine engineer. The chapters devoted to general graphic methods are fundamental to any treatment of the subject, and may be unreservedly commended. Beginning with the graphics of arithmetical calculation, they proceed with the graphic measurement of areas, the graphics of forces, couples and center of gravity. We have then two chapters on the fundamental theory of beams, treated by graphics, and, after the chapters on trusses, we find the graphics of friction and of shafting, the latter including shear, torsion and bending. The constructions discussed include shafts with single overhung cranks, with center cranks and with double cranks.

MECHANISM. By S. Dunkerley. Third edition. 448 5½x8½-inch pages, with 451 illustrations. Longmans, Green & Co., London and New York. Price, $3.

The influence of the method of analysis of mechanical movements, introduced by Professor Reuleaux, has been fairly revolutionary. It is now the accepted basis of nearly all similar work on pure mechanism and its influence on the present volume is obvious at a glance. As the author states in his preface, the book treats of pure mechanism, but its illustrations will be found to be drawn chiefly from constructions which are in general use.

The general idea of the scope of the book may be obtained from even an incomplete list of the mechanisms discussed, among which we find speed cones, quick returns, epicyclic trains, parallel motions, pantographs, the Oldham coupling, the toggle joint and the Hooke joint. In addition to specific mechanisms of this kind, we find full and adequate treatment of such subjects as velocity ratio diagrams applied to complex link work, acceleration diagrams, gearing, cams and planimeters. The discussion of these subjects is extremely clear and instructive, and students of pure mechanism will find the volume of a high degree of interest and value.

Personals

Walter L. Bickley has been elected president of the Penn Steel Castings and Machine Company, Chester, Penn., succeeding Mortimer H. Bickley, recently deceased.

Prof. John Allen, of the University of Michigan, has accepted a position at Robert College, Constantinople, where he will be in charge of the engineering department.

V. D. Tompkins, until recently connected with W. & L. E. Gurley, Troy, N. Y., has accepted a position at the Robert College, Constantinople, where he will act in the capacity of superintendent of shops.

E. Lawrenz, an occasional contributor to our columns, and recently in the employ of Hanford & Barkley, Rochester, N. Y., has established an office in Detroit, Mich., as a mechanical engineer and designer of special machinery.

Charles E. Sweet, formerly with the Westinghouse Machine Company, and more recently plant manager of the E. M. F. Company, has been appointed general superintendent of the Northway Motor Manufacturing Company, Detroit, Mich.

James W. Brown, who has for several years been engaged in the manufacture of the Lanston Monotype, originally with the William Sellers Company as toolroom foreman and for the past several years with the Lanston Monotype Machine Company, Philadelphia, Penn., as chief tool designer, has resigned to enter the employ of the General Motor Company, of Detroit, Mich., in the production department, with special reference to the tool department of the several constituent plants.

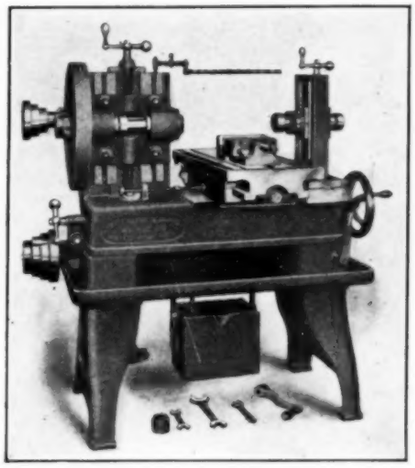
Shop Equipment News

ANY and all new or improved machines, tools or shop appliances of interest to men responsible for results in machinery-making plants will be briefly illustrated and described here — the machine shop news.
A more full and detailed description will be given — when it is real news — if it can appear here first — before it is sent to other papers. ALL descriptions appear in ALL four editions of the paper—Weekly, Monthly, Weekly English and Weekly German

Lincoln Miller

The accompanying illustration shows an improved design of Lincoln miller recently developed by the Carter & Hakes Machine Company, Winsted, Conn.

This machine is in the main their regular model with a few improvements and additions, among which are a taper bearing on the front end of the spindle made larger and longer; bronze bushings replacing babbitt half boxes, and a self-adjusting connecting rod which ties the cone-shaft bearing to the front end of the head in a similar manner to the opposite end, thus insuring rigidity to the yoke which carries the cone and cone shaft. In addition a bronze bushing is used for the support of the cutter arbor in place of the foot-block spindle in taking extra heavy cuts. A double arm support for the outer end of the worm shaft is furnished and all gears are completely guarded.



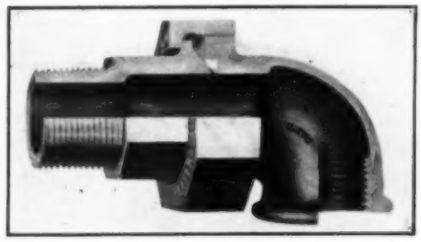
NEW MODEL OF LINCOLN MILLER

Jefferson Union Elbows

The accompanying halftone shows an improved union elbow recently put on the market by the Jefferson Union Company, Lexington, Mass.

These are made both male and female and the latest type differs slightly from the regular line previously shown.

The brass ring is turned from seamless brass tubing; the ring sits in a recess away from the runway of the pipe, with an iron wall on each side, and is thus secured against any possible loosening on account of the difference in the expansion and contraction of the iron and brass.



JEFFERSON UNION ELBOW

A New Black Rock Grinder

The Black Rock Machine Company, Bridgeport, Conn., is manufacturing a special taper grinder, shown in Figs. 1 and 2, which is intended for grinding cock plugs or taper of from 15 to 45 degrees and up to four inches in length. The machine also has a special headstock

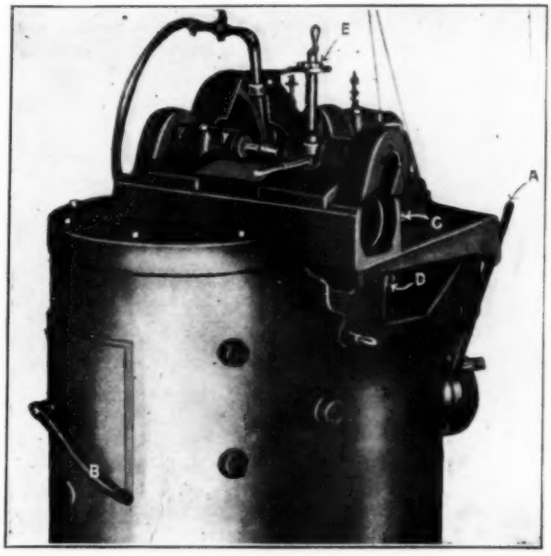


FIG. 1. FRONT VIEW OF NEW BLACK ROCK GRINDER

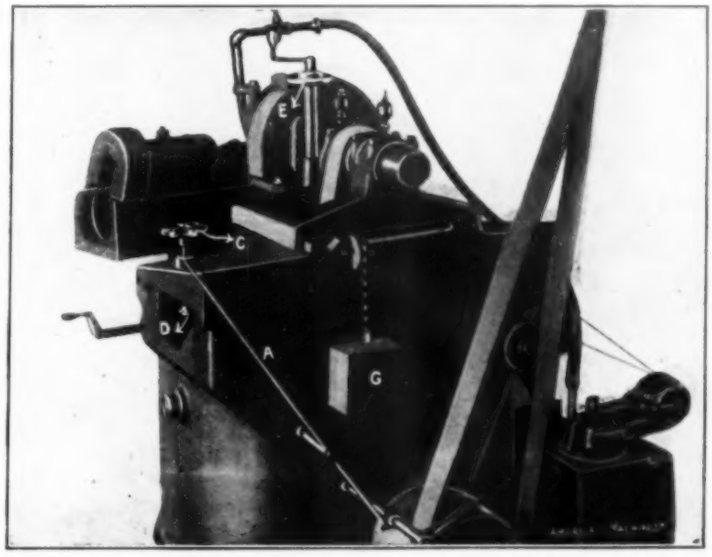


FIG. 2. BACK VIEW, SHOWING SLIDES OF GRINDING HEAD

for grinding flat washers as large as four inches in diameter.

A sectional front view is given in Fig. 3 and this, with the two halftones, will make clear the construction and operation.

A large cup grinding wheel is used and the work centers are both driven simultaneously by means of long helical gears, which prevents slipping or variation in the work being ground. The machine is entirely self contained, having no countershaft, the grinding wheel being started by means of the shift lever *A* and the work centers are started by pressing down the foot lever *B*, which also starts the reciprocating motion of the grinding head and release of the foot lever stops these, the mechanism being so arranged that the carriage always stops with the grinding wheel away from the work.

Feeding of the wheel onto the work is done by turning crank *E*, which operates a screw through bevel gears, and the length of the grinding stroke is varied by means of a crank shown at *C*, which shifts lever *D*, carrying a roller on the opposite end fitting into a slot in the rocking cam lever *F*, there being no carriage stops, the reversing being done by cam motion alone, which is only possible on a short-stroke machine. A weight *G* keeps the grinding head tight on the feed screw and a special spring take-up device on the end of the spindle keeps it tight against the front thrust collars.

The center heads are adjustable on their slide by means of setscrews and the slide may be shifted by turning a crank on the right-hand side just below the end. Different angles are obtained by loosening the cap screws and shifting the entire head.

A good-sized pump throws an ample supply of water onto the work and the entire machine is compact, taking but little floor space, and is remarkably free from any tendency to chatter or vibrate.

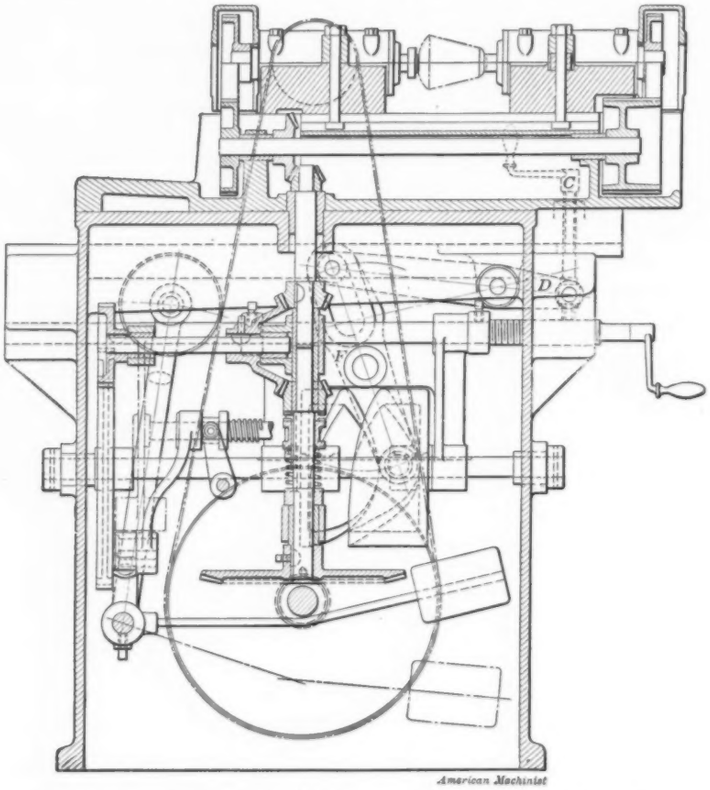


FIG. 3. SECTIONAL FRONT VIEW OF THE BLACK ROCK GRINDER

Hand Tachometer

A new hand tachometer has been recently placed in the market by Schuchardt & Schütte, New York City.

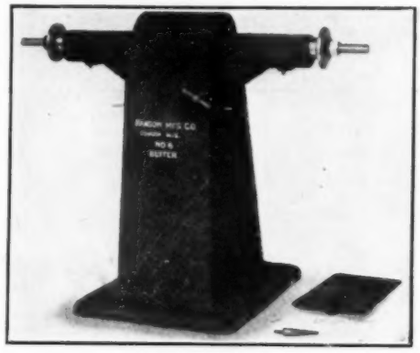
It is a more universal instrument than the one they previously marketed, in that it forms a combined hand tachometer and cut-meter, being equally convenient for indicating rotative speed as well as surface-cutting speed. It indicates the number of revolutions of shafts and spindles, and furthermore the periphery or belt speeds are determined. The result (either revolutions per minute or feet per minute) is instantly shown on the dial, without the necessity of calculating or timing with a watch.

Four different speed ranges are provided, which may be selected according to requirement. There is only one spindle for all ranges of speed, and adjusting is effected by simply shifting the thumb slide, while the object under test is running.

Buffing Lathe

The buffing lathe shown in the accompanying halftone can be belted through the floor from a line shaft below with the belt entirely inclosed. The belt shifter is located in the front of the machine, as shown, and the belt is shifted by a half turn of the handle. The machine can also be belted from a countershaft above.

The machine is adapted for heavy buffing and grinding purposes, and is equipped with long journals. These are babbitted, dust proof, and are provided with ring oiling.

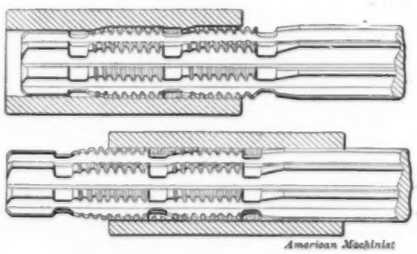


BUFFING LATHE

The machine weighs 750 pounds and has a floor area of 33¼x25¼ inches, and is a recent product of the Ransom Manufacturing Company, Oshkosh, Wis.

A Novel German Reamer

This new reamer has a pilot end, and behind this are two fine threads, out of step by half a pitch. The first threaded portion acts as a tap and pulls the reamer in, while the second threaded portion, in consequence of the displaced pitch, cuts away most of the threads left by the first, so that there remains only a little for the reamer proper to do.



A NOVEL GERMAN REAMER

It has been found especially useful for reaming out long bearings and also for bringing bolt or rivet holes into line, and replaces the ordinary taper reamers.

It is made in all sizes of holes from ¼ to 2 inches diameter, by J. A. Maffei, Munich, Germany.

Spring Meeting of the A. S. M. E.

The spring meeting of the American Society of Mechanical Engineers was held in Pittsburg from May 30 to June 2, with a registration of some 700. The local committee took advantage of the opportunities offered by Pittsburg industries to arrange for excursions to many manufacturing plants and engineering works. The members and guests who made the visits are greatly indebted to the thoughtful care with which most of the trips were planned by the members of the committee.

The opening session on Tuesday evening was a greeting and welcome to the visitors. A pleasing incident was the presentation to the president of the society, Colonel E. D. Meier, of an engrossed testimonial expressing the good wishes of the members on his seventieth birthday, which fell during the meeting.

The professional sessions were arranged according to related topic as treated of in the professional papers. Wednesday morning was devoted to the Cement Works sessions, followed in the afternoon by a visit to the plant of the Universal Portland Cement Company and the Westinghouse works at East Pittsburg.

Machine Shop Session

On Wednesday evening the Machine-Shop session and Gas-Power session were held simultaneously.

The subject of assembling of small interchangeable parts was presented by John Calder, with particular reference to typewriter parts. Halcom Ellis read a paper, "Process of Assembling a Small and Intricate Machine," and F. P. Cox, "Quantity Manufacture of Small Parts."

Mr. Cox's paper will be printed in a later issue.

The second subject considered was miller cutters, with a paper by A. L. DeLeeuw. This has been printed in two articles at pages 753 and 787. Cutters with wide-spaced teeth are advocated for some classes of work, and have the distinct advantage of requiring less power to drive than cutters with closer-spaced teeth. Discussion was animated, Mr. Parker gave the results of a few tests made by him at the works of Brown & Sharpe in a written discussion as follows:

A Test of Milling Cutters

The question of milling cutters bears a very important part in connection with the miller for the economical production of work, in either a tool room or a manufacturing capacity, and any suggested change in the present type of cutters, which may add to their efficiency, should receive due consideration.

Much study and years of actual experience have been involved in the design of cutters as made today, in that they may possess qualities fitting them for all kinds of general milling. Any type of cutter that possesses any one quality to such an abnormal extent that its other attributes are made less efficient cannot be accepted as the ideal cutter for general use.

The type of cutter Mr. De Leeuw has introduced undoubtedly has the merit of consuming less power than the regular cutter, as his tests show, and which are confirmed to a large extent by a number of comparative tests made at the works of the Brown & Sharpe Manufacturing Company. This distinctive quality is of great interest and gives the cutter a value which would be enhanced were it not for some limitations which developed during the tests. For the heavier class of millers the new cutter proved entirely capable, but on the lighter class satisfactory results were not obtainable.

More Pounding with Few Teeth.

It is evident that the new cutter, having so few teeth, produces an intensified hammering action on the work over that of the regular cutter, being due to the fact that there are not sufficient teeth in contact to steady the action, and, unless the machine has the rigidity and massiveness to withstand this pounding effect, the smooth action so essential to good milling practice is not obtained. This undesirable feature was very noticeable on a No. 2 universal miller, which is essentially a tool-room machine and is necessarily of a light character to enable it to be handled quickly and easily. The pounding was so severe that the tests had to be suddenly terminated, owing to the abusive action the machine was receiving. In another machine, somewhat heavier than the one referred to, work, when using the ordinary cutters, could be held in the vise clamped in the usual way; but, with the new cutters it would be pushed bodily out of the vise, and auxiliary means had to be provided to hold it in place. This would indicate that the new cutters would not be suitable for any class of work, which cannot be firmly secured and also where great care has to be exercised in clamping down work to the fixture or machine table, to prevent springing.

Comparative tests were made between the new and regular milling cutters, in both cast iron and steel, on the No. 5 plain miller. The machine was motor driven and was connected to a Westinghouse graphic meter for recording the tests, which is probably one of the best existing methods for making comparative tests. The cutters used were 3¼ inches diameter, 12 degrees spiral, right and left hand. The new cutters had 9 teeth and the regular, 16. These teeth showed that, in removing 24 cubic inches of cast iron per minute, the new cutters consumed 20 per cent. less power than the ordinary cutters—15 per cent. in removing 15 cubic inches, and 14 per cent. in removing 12 cubic inches of machinery steel. As regards the smoothness of action, there was very little difference noted between the two types; both being very good. A finishing cut was taken with each cutter in both cast iron and steel; all the surfaces were excellent, the surface made by the regular cutter having a trifle better finish.

Test with End Mills

Comparative tests were made on the No. 3 plain miller with both the new and the regular type end mills, of the following diameters and number of teeth: 1 inch—4 and 10; 1½ inches—6 and 12; and 2 inches—8 and 14. In all cases the end mills with the smaller number of teeth consumed less power in both cast iron and steel. The gain in cast iron was 19 per cent. for the 1 inch diameter; 16 per cent. for the 1½ inches diameter, and 18 per cent. for the 2 inches diameter; and in steel, 14 per cent. for the 1 inch diameter, 12 per cent. for the 1½ inches diameter, and 9 per cent. for the 2 inches diameter. In these tests it was found that the new style mill had a tendency to work loose, notwithstanding that the hand of the spiral, in relation to the rotation of the mill, had the effect of drawing the mill in toward the spindle. This trouble was undoubtedly caused by the fact that the mills, having so few teeth, the amount of work imposed upon each tooth produced a pounding effect which jarred the mill loose. It is only fair to say that the cuts taken were far beyond what would be used in ordinary practice, and that possibly under ordinary working conditions no bad effect might result. However this may be, this point would have to be carefully tried out before this type of mill could be accepted in place of the regular, which developed no such trouble.

In making the tests on the No. 5 plain miller with the milling cutters, the point regarding lack of chip room that Mr. DeLeeuw emphasizes was closely watched in the regular cutters, and, although the chip taken was far in excess of what would be demanded in ordinary practice, namely, 4/10 inch deep and 10 inches feed per minute, there was apparently sufficient space, as not the slightest sign of clogging was in evidence.

For some time past stock face milling cutters have been made with the teeth set at an angle, both on the face and periphery, whereas the older type had radial teeth, both on the face and periphery; in both cases the pitch of teeth approximates 1½ inches. As a matter of interest, comparative tests were made between these two types. The results were, with the new type, a saving

of 12 per cent. of power in cast iron, and a gain of 6 per cent. in favor of the old type, in steel. This last was somewhat surprising; and, were it not for the very careful manner in which these comparative tests were made and recorded, the result might be questioned.

A test was made with new and old side-milling cutters, in steel, 4 inches diameter, 14 and 28 teeth respectively. One pair of each was used. A gain in power of 20 per cent. in favor of the new was obtained. In this test the cutters with the less number of teeth cut the easier and the work had a better finish.

In briefly summing up the situation, I believe Mr. DeLeeuw has developed an interesting type of cutter which possesses to a marked degree a valuable attribute—that of saving power; and, in certain classes of work, such as heavy manufacturing milling, it will doubtless find a field most suitable to its characteristics. But, in view of the knowledge gained by the comparative tests made, I doubt very much whether it will be as successful a cutter for general purposes as its predecessor.

A. F. Murray gave the results of his experience, he having used cutters with wide-spaced teeth for a number of years. This will appear later.

Thursday's session was devoted to miscellaneous subjects, and Friday's to steel works.

The social features included a reception and dance on Thursday evening and numerous automobile rides for the visiting ladies.

Use of Towels Instead of Waste

By Arthur E. Elmer

Many objections to the use of rags and waste in a machine shop plant are economically eliminated in the use of wiping towels for similar purposes.

The use of rags and waste in a manufacturing plant is not only extravagant, as figures to follow will prove, but dangerous as well. Waste is bad to use on automatic machinery or machines with oil pumps, as the lint clogs the mechanism. The rags come in all sorts of material and in all sizes. This necessitates cutting and bundling before they can be distributed, which adds to the initial cost. As they become soiled they are liable to be thrown into all sorts of receptacles where they might, by an oversight, remain a number of days before being removed. This constitutes a danger of fire from spontaneous combustion.

Advantages in the Use of Wiping Towels

The first advantage is, of course, the economy over the use of rags and waste. The next is in the simple method of handling, which in the Cadillac plant is made possible by the efficiency of the tool-supply room system, a system unique in many respects and probably comparing favorably with any in the country, in its ability to care for minute details regarding tools, supplies, etc.

Each supply-room (of which there are 12) is furnished with a sufficient number of towels to care for the needs of the department which it feeds, and for this number they are held responsible. The workmen lose no time in going after the towels, as each morning boys from the various supply-rooms pass among them, exchanging clean towels for dirty ones, and tabulating them. Tallyboards tell them the number of towels allotted to each man.

When the work of the boys is finished, the dirty towels are collected from their metallic receptacles in each supply room, and taken to the laundry. Worn towels are sorted out and used again as rags in places where the use of good towels is not practical. The supply-rooms are furnished new towels in place of the worn ones, thus leaving the number charged to each room the same. A workman must always have on hand as many towels as are charged to him, if he cannot produce them, the missing ones are deducted from his pay.

The boys who distribute become so expert that each can easily serve 200 men in an hour. The number of towels allowed the men is generous, 450,000 per year being laundered; this has resulted in a noticeable improvement in the cleanly appearance of the men and their machines.

Laundry Equipment

The laundry equipment consists of the following machines: One centrifugal steam turbine oil extractor; one centrifugal water extractor, belt driven; one large laundry washer (reversible motion); one small laundry washer (reversible motion); one steam-heated mangle (motor driven); one ventilated dry oven; one oil filter; one 5-horsepower motor.

Fig. 4. A Supply-room Boy Starting Out

This equipment cost approximately $1200. The towel-washing experiment was so successful from every viewpoint that a small laundry washer was added and the towels from the office lavatories

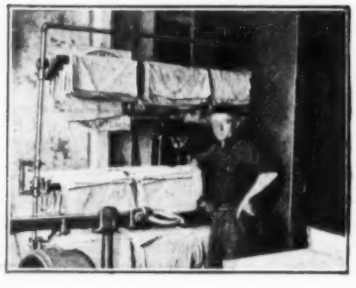


Fig. 1. Section of Laundry, Showing Drying Oven and Rack

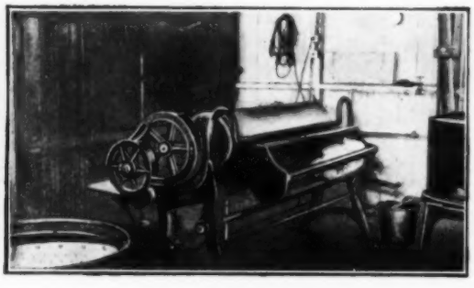


Fig. 2. Mangle, Oil Extractor and Water Extractor

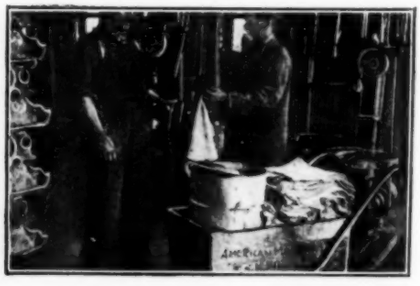


Fig. 3. Exchanging Soiled Towels for Clean Ones; Workman at Machine

taken care of; as are also large canvas automobile covers, steering-wheel covers, canvas machine aprons; in fact, everything about the plant that needs laundering. These things formerly were sent to the commercial laundries where acids, etc., are used in the cleaning process, thus rotting the fabric.

The shop towels are washed at a cost of $1.50 per thousand; the lowest bid to be had from a commercial laundry was $3.50 per thousand. On the amount of towels washed per year (450,000) the saving would amount to $900. Below are given figures showing cost in 1909 when rags and waste were used exclusively, and in 1910 after the introduction of wiping towels and the establishment of a laundry. The cost which appears for rags and waste during 1910 is due to the fact that the new system was not thoroughly in operation during the first part of the year. The figures for 1911 would show this item almost eliminated.

Cost of rags and waste, 1909.....		$5807.72
Towels worn out, 1910....	$747.31	
Rags and waste, 1910.....	1475.57	
Laundry labor and material (soap, etc.), 1910.....	966.92	
	$3189.80	
Credit by oil extracted and office towels washed.....	$225.98	
Credit by rags saved.....	109.35	
	$335.33	2854.47
Total amount saved in 1910...		$2953.25

Eccentric and Elliptic Gears

By J. A. Haigh

In weaving a certain class of silk goods it was necessary to design a new head motion for the looms in order to hold the shed open longer, as the warps were very fragile and the least touch of the shuttle would cut the ends.

The gears for this attachment in ordinary use are straight spurs; two to one. It was therefore necessary to make a fast and slow motion—two to one—with almost dead stops at two places and two very fast movers. We finally got out an eccentric and elliptic-gear motion that completely filled the bill.

The elliptic gear had a major and minor axis of thirteen inches and eight inches respectively, and the eccentric gear was five inches pitch diameter and 1¼ inches off center; thirty teeth, six pitch. The elliptic gear was to have sixty teeth, six pitch.

We could find nothing in our library on the subject and after some trials and experiments on the board it was found that a true ellipse would not work with the eccentric gear. A corrected ellipse was finally constructed which would mesh and follow the eccentric pinion. These pinions were turned and cut on a mandrel which was 1¼ inches out of center and gave us no trouble after the laying out was completed.

The elliptic gear we could have cast very nicely with the teeth in it, but as the customer would not accept a cast-tooth gear, we had to cut them. The elliptic-gear blanks were cast to as true an outline as possible and bored and faced on both sides with the outside unfinished. We then made a 1/16-inch brass templet true to the drawing and marked the pitch and root lines on it, also the major and minor axes.

The center of the major axis was the center of each end tooth and the pinion was cut with a space in the lowest point to match. The centers of the teeth and cuts were stepped off around the pitch line and with a small center head the center lines were scribed toward the major axis.

We then clamped four wheels on a mandrel with the templet bolted to the face of the outside one. Instead of using a surface gage, as described in the AMERICAN MACHINIST gear book, we clamped a square to the face of the miller column and squared each tooth space center line with another square, first cutting one tooth and then the one diametrically opposite. In this way it required less table adjustment, for cutting the templet and first four wheels. After the first set we cut the remaining wheels with the templet alone. This gave us some very fair elliptic gears, though some of them needed a slight correction with the file. Of course these gears were not absolutely accurate, but answered the purpose very nicely. We used a No. 4 cutter to cut around the ends and a No. 2 cutter on the sides of the wheel. These wheels are now running and giving entire satisfaction.

Design of Eyebolts and Lifting Eyes—Errata

Our attention is called by the author to the following errors, in the article under the above title, appearing on page 929.

The formula on page 931, second column should have read

$$L = \frac{P}{1 + 8 \cdot \frac{H}{b} \cdot tan.\, G.}$$

In table 1, the seventh column should have been headed $D \div A$, instead of $B \div A$. In the caption to Fig. 4 the word slugs was substituted for slings.

About 10 per cent. of crude petroleum is available as gasolene. The remaining 90 per cent. is sold under the name of gas oil, solar oil and domestic fuel oil, all being practically the same material. A gallon of this fuel oil contains approximately the same amount of energy as a gallon of gasolene and costs from ⅛ to 1/10 as much. This would make motors, which can utilize the energy in the crude oil.

Increasing Shop Capacities

Metal Working

NEW ENGLAND

The United Shoe Machinery Company, Beverly, Mass., will build additions to its plant.

The Bridgeport (Conn.) Hardware Manufacturing Company will build an addition to its foundry.

The Berbecker & Rowland Company, Waterville, Conn., manufacturing brass specialties, will build an addition to its plant.

An addition is to be built to the machine shop at the plant of the New London Ship and Engine Company, in Groton, Conn.

The New Haven (Conn.) Machine Screw Company has incorporated and will increase capacity of its plant. Part of new machinery required has already been ordered.

The New Departure Manufacturing Company, Bristol, Conn., making hardware specialties, is erecting a two-story addition to be used for experimental laboratory and drafting department.

The Thomas Dunlap Company, Bridgeport, Conn., has been incorporated with $25,000 capital to manufacture and deal in steel, iron, metal, etc. Incorporators, Thomas Dunlap, F. W. Allen, Paul L. Miller.

News items for the sales department — where more equipment will be needed. Authentic news is solicited for this department, not rumors or gossip — facts

MIDDLE STATES

The Moline (Ill.) Tool Company is erecting an addition.

Fire destroyed the plant of the H. Franke Steel Range Company, Cleveland, Ohio.

Fire destroyed the foundry of the Ashland (Ohio) Foundry and Machine Company.

The Erie Railroad is to enlarge its shops at Hornell, N. Y., at a cost of about $60,000.

Galion Iron Works Company, Galeon, Ohio, has increased its capital and will add to its plant.

The Hotel Investment Company, of Cleveland, Ohio, has taken out a permit for a garage.

The De Tamble Auto Company, Anderson, Ind., is contemplating the erection of new buildings.

T. J. Cunningham is having a garage built at Thirty-third and Chestnut streets, Philadelphia, Penn.

Ohio Motor Car Company, Carthage, Ohio, will make additions and improvements to its present plant.

T. E. Hurley will build a two-story garage on Brown street, near Fortieth street, Philadelphia, Penn.

The Delaware & Hudson Railroad is receiving bids for building a roundhouse at Binghamton, N Y.

Geo. C. Keim is having a garage built at Westview street and Wayne avenue, Philadelphia, Penn.

The H. W. Cooper Saddlery Hardware Company, Moline, Ill., has let contract for a one-story addition.

The Baker Motor Carriage Company, Cleveland, Ohio, will enlarge its plant and install some new equipment.

The M. Hertenstein Company, Columbus, Ohio, manufacturing stoves, will erect an addition to its molding room.

Work has been commenced on the new structural mill for the Republic Iron and Steel Company, at Lansingville, Ohio.

The Pressed Steel Car Company has taken out a permit to build a $20,000 addition to its plant at Pittsburg (north side), Penn.

Contracts have been let for a four-story machine shop and garage for the Hydraulic Pressed Steel Company, Cleveland, Ohio.

The White Company is going to build a garage and machine shop at Fifty-seventh street and Twelfth avenue, New York City.

The Chicago Pneumatic Tool Company has awarded contract for the erection of several additions to its plant at Chicago Heights, Ill.

Auto Service Building Company will build a six-story auto garage, corner West End avenue and Sixty-fourth street, New York City.

The Kerr Turbine Company, Wellsville, N. Y., has reorganized and new capital added. New machine shop is in course of construction.

Tiffen Wrench Company, Tiffen, Ohio, has been incorporated by Chas. F. Nighswanger for $50,000. Will manufacture a line of wrenches.

The Ideal Concrete Machinery Company, South Bend, Ind., has increased its capital from $250,000 to $500,000 and will enlarge its factory.

The Wm. Cramp & Sons Ship and Engine Building Company has acquired title to a site on which it will build a large addition to its machine shop.

The Georgian Manufacturing Company, Binghamton, N. Y., is contemplating the enlargement of its plant. The principal output is brass valves.

Estimates are being asked for all work on the artillery ammunition assembling shop, and a one-story building at the Frankford Arsenal, Philadelphia, Penn.

The Ellis Motor Car Company will erect a two-story automobile garage and repair shop at Central avenue and Second streets, Newark, N. J., to cost $50,000.

The Black Hawk Motor Company, East Moline, Ill., has been incorporated with $50,000 capital to manufacture motor cycles by H. S. Dickinson and others.

J. S. Giles & Sons, Chicago, Ill., have incorporated with $100,000 capital to manufacture dies and machinery. Incorporators, John S. Giles, Carl O. Giles, Guy H. Giles.

The Midland Motor Company, East Moline, Ill., has been acquired by the Deere estate. Plant will be placed in operation and automobiles manufactured. Address J. M. Dale, Moline.

The Henry Grease Cup Manufacturing Company, Terre Haute, Ind., has been incorporated with a capital of $40,000 by J. P. Gilmour, Michael Henry, John Marmour and Charles Fox.

The Cushion Corner Bed Spring Company, Chicago, Ill., has been organized to manufacture bed springs. Capital, $25,000. Incorporators, Herbert D. Jones, Eugene Ziegler, Geo. C. Wissler.

The Baleo Manufacturing Company, Chicago, Ill., has been incorporated to manufacture machinery and electrical devices. Capital, $5000. Incorporators, H. M. Cox, Geo. L. Cragg, M. S. Rosensweig.

Fire destroyed the buildings occupied by the Brown & Zortman Machinery Company, and the Reinforced Brazing and Machine Company, on Liberty avenue, Pittsburg, Penn., causing a loss of over $40,000

The Ajax Gear Company, Chicago, Ill., has been incorporated to manufacture gears, machinery and do general contract work. Capital, $2500. Incorporators, Chas. S. Burton, Robt. N. Burton, Paul J. Githmann.

United Refrigerator and Ice Machine Company, Chicago, Ill., has been incorporated with $15,000 capital to manufacture ice machines, etc. Incorporators, Henry G. Koellner, Samuel Spitzer, H. M. Rosegluan.

The Cleveland Calculating Machine Company, Cleveland, Ohio, has been organized with $40,000 capital to manufacture and sell calculating and typewriting machines by E. A. Grant, C. J. C. Grant, A. S. Dennis, etc.

The Canton Castings Company, Canton, Ohio, has been incorporated with $250,000 capital to manufacture and sell iron and steel products of all kinds. ncorporators, S. E. Shull, S. A. Buchman, Arthur J. Hill, etc.

The Thomas Auxiliary Spring Company, Canisteo, N. Y., has been organized to manufacture automobile springs, shock absorbers, etc. Capital, $10,000. Incorporators, Chas. L. Thomas, Canisteo; Ernest C. Coulton, Alex. Fleming, Buffalo.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids June 20, for eight engine lathes (Schedule No. 3636), one boring and turning mill (Schedule No. 3637), one splitting shear (Schedule 3630).

The Columbia Engineering Company, Cleveland, Ohio, has been incorporated to manufacture structural and ornamental iron and steel and metal articles generally by Wilhelm Kirschner, Herman Daedelow, Henry Gehring, etc. Capital, $10,000.

The S. D. Manufacturing Company, Brooklyn, N. Y., has been incorporated to manufacture automobiles, motor cycles, etc. Capital, $30,000. Incorporators, J. R. Spangler, 155 Ridgewood avenue; Otto C. DeWald, 47 Shepherd avenue, etc.

The A. W. Jones Manufacturing Company, Cleveland, Ohio, recently incorporated with $2,500,000 capital, is planning the erection of a $300,000 plant for the manufacture of gasolene engines, etc. Julius Fleishman, of Cincinnati, is interested.

The Dayton Automobile Company, Dayton, Ohio, has been organized with a capital of $30,000 to manufacture and sell automobiles and accessories and do a general garage business. J. E. Studybaker, J. N. Agentroad, C. N. Hunter, etc., incorporators.

SOUTHERN STATES

The Morgantown & Kingwood Railroad Company has awarded contract for the erection of new shops at Morgantown, W. Va.

The Success Pressed Steel Slat Conveyor Company, a New Orleans, La., corporation, capitalized at $750,000, is planning the erection of a plant at Carrollton.

WEST OF THE MISSISSIPPI

Josh Clark's blacksmith and machine shop, at Corydon, Iowa, was burned.

The Whitney Company, Portland, Ore. (lumber), is building a new machine shop.

Jake Housemann, of Menagha, is planning to rebuild the foundry at Winthrop, Minn.

R. J. Westwood, Vancouver, B. C., is having plans prepared for a new machine shop.

John Leschler has secured a site for the erection of a blacksmith shop at Williston, N. D.

L. S. Hart, Spokane, Wash., is having plans prepared for a new commercial garage and repair shop.

Henry Rabbes and W. C. Hawley, Klamath Falls, Ore., will establish a commercial garage and repair shop.

The Clark Steel Vault Company, of Columbus, Ohio, is considering the erection of a branch factory at Waterloo, Iowa.

Loomis & Blair, Los Angeles, Cal., have leased quarters and will establish a repair shop for motorcycles and small work.

Jos. Girstenberg and A. D. Arthur, of Adair, Iowa, will remodel the Edwards building for a washing-machine factory.

Bert H. McDonald, Alhambra, Cal., has had plans prepared for a new commercial garage and repair shop. Modern equipment will be used.

H. C. Capwell, Oakland, Cal., is having plans prepared for a commercial garage and repair plant. Modern equipment will be installed.

The Christopher & Simpson Architectural Iron and Foundry Company, St. Louis, Mo., is to erect a new bridge shop at a cost of over $50,000.

The British Columbia Electric Railway, Vancouver, B. C., is having plans prepared for new car barns and repair shop to be erected at Chilliwack.

The A Auto Company, Sacramento, Cal., is having plans prepared for a large automobile factory to be erected on its tract at Riego, near Sacramento.

The Chicago St. Paul, Minneapolis & Omaha will erect a one-story machine shop at Randolph, near Drake street, St. Paul, Minn. Cost, about $35,000.

The Oregon Railroad and Navigation Company, will, it is said, remove its repair shops from Hillyard, Wash., to Whitefish, Mont., and increase the capacity.

The Oil Well Supply Company, Los Angeles, Cal., manufacturer of oil-well machinery, has taken out a permit to make improvements and additions in its factory.

The Metcalf Manufacturing Company, San Diego, Cal., manufacturer of acetylene gas machinery, will make extensive additions and improvements in its plant.

The Parker Iron Works, San Bernardino, Cal., will make extensive improvements in its machine shop and also install a gray-iron and steel casting foundry.

The Peck Motor Repair Company, Klamath Falls, Ore., has been organized by M. A. and C. A. Peck. The company will build a machine shop and iron-working plant.

A. Jamieson, Los Angeles, Cal., is having plans prepared for a commercial garage and repair shop. Modern machinery will be installed. C. C. Rittenhouse, architect.

J. W. Hedges, Escondido, Cal., is having plans prepared for a new building, part of which will be used as a machine and repair shop. Modern machinery will be installed.

The Oxy-Acetylene Welding Machine Company, Kansas City, Mo., has leased a building at Fort Scott and Mastin place, and will engage in the manufacture of welding machines.

The Chicago, St. Paul, Minneapolis & Omaha Railway Company has taken out a permit for the erection of a new $30,000

machine shop at the Randolph Street shops, in St. Paul.

The Motor Accessories Company, Los Angeles, Cal., has leased property and will establish an addition to its present plant. A repair department will be installed and modern equipment used.

R. H. Thompson, Portland, Ore., has purchased property on Fourteenth street, and will build a three-story commercial garage and repair plant. The plant will be occupied by the Speedwell Motor Car Company.

CANADA

The Munroe Steel and Wire Works Company, of Winnipeg, will build a new factory there.

The Chatham Malleable Iron and Steel Company, of Chatham, Ont., is building a new factory.

The Canadian Iron Corporation, of Montreal, will equip a $75,000 plant at Nictaux Falls, N. S.

The British Columbia Electric Railway will equip large repair shops and power house at Victoria, B. C.

Fire did $25,000 damage to the repair plant of the Central Garage Company, at Winnipeg. Will be replaced at once.

The Imperial Car, Ship Building and Dry Dock Corporation is clearing land for a million-dollar plant, at Vancouver, B. C.

The plant of the Canadian Car Foundry Company, Amherst, N. S., was damaged by fire to the extent of about $200,000.

The Canadian Westinghouse Company, Hamilton, Ont., has taken out a permit for brick additions to the pattern and machine shops, to cost $65,000.

W E. Davies, John Henry Rue and others, of Calgary, Alberta, are forming a company with $150,000 capital to establish a plant for the manufacture of nails, horseshoes, builders' hardware, etc.

McDougall, Jenkins Engineers, Ltd., have acquired the plant of the Albion Iron Works, Vancouver, B. C. The capacity of the plant will be greatly increased; the machine shop will be extended 250 feet and new machinery installed. About $150,000 will be expended.

GENERAL MANUFACTURING

NEW ENGLAND

Neouard & Barrows, Belfast, Me., will install an engine.

H. B. Ives, New Haven, Conn., will install a boiler and engine.

The town of Westbrookfield, Mass., will install waterworks system.

Leviseur & Co., Salem, Mass., will install boiler, engine and pumps.

F. L. Hervey & Co., Fall River, Mass., will install a boiler and engine.

Manchester, N. H., will spend $30,000 on improving its water system.

The Day-Emerson Shoe Company, Brockton, Mass., will build a new shoe factory.

Bigelow Carpet Company, Lowell, Mass., has awarded contract for a new mill.

South Dighton, Mass., will spend $40,000 on improving its water-supply system.

The Lawton Mill Company, Plainfield, Conn., will install steam electric power plant.

The town of Longmeadow, Mass., will build a pumping engine house and reservoir.

Fuller & Halway Company, Augusta, Me., is drawing plans for a new grain elevator.

The Cushnoc Paper Company, Augusta, Me., is building an addition to the ground pulp mill.

The Winooski River Power Company, Waterbury, Vt., will install three hydraulic turbines.

Cheney Brothers Company, South Manchester, Conn., will build an addition to its box factory.

The Bridgeport (Conn.) Enamel Dial Company has taken out a permit for a new factory building.

The St. Johnsbury (Vt.) Electric Company will install two hydroelectric units of about 200 kilowatts.

The Hartman Brewing Company, Bridgeport, Conn., will make additions to the boiler-house equipment.

The Commonwealth of Massachusetts will install a boiler in the armory at Milford and armory at Natick.

The Boston Cold Storage and Terminal Company will build a new cold-storage plant at East Boston, Mass.

The Mananatiquot Rubber Works Company, Boston, Mass., will install an engine in the South Braintree factory.

James L. Humphrey, Jr., Fall River, Mass., is building a large addition to its plant at Eleventh and Pleasant avenues.

The Central Ice Manufacturing Company, of Boston, Mass., will build a new artificial ice plant, boiler and engine house.

Arthur H. Pierce has commenced the erection of a new woodworking plant, at Dayville, Mass., to replace the one recently burned.

The Colt Patent Firearms Company, Hartford, Conn., will erect an addition to be devoted to the blueing, coloring, hardening and treating of steel.

Ground has been broken for the large three-story brick mill of the Plainfield Mill Corporation, at Hartford, Conn. It will employ about 1100 hands. Cotton and silk goods will be manufactured.

The H. & W. Company, New Canaan, Conn., has been incorporated with $100,000 capital to manufacture window screens, weather strips, etc. Incorporators, Geo. D. Hartlett, Wm. A. Wheeler, S. Kuriansky.

The South Coventry Paper Company, Coventry, Conn., has been incorporated to manufacture paper, etc. Capital, $20,000. Incorporators, Andrew J. Bowen, F. D. Jordan, Willimantic; N. Jas. Nichols, South Coventry.

The Plainfield Mills Corporation, Plainfield, Conn., has been incorporated to manufacture cotton cloth, silk, etc. Capital, $600,000. Incorporators, Harold Lamton, Plainfield; S. Harold Greene, Boston; Arthur Perkins, Hartford.

MIDDLE STATES

Buckeye Glass Company, Shady Side, O., will make improvements to its plant.

M. H. Bekkedal, of Westby, Wis., will erect a box factory at Conderay, Wis.

The Municipal Gas Company, Albany, N. Y., will enlarge its plant on Trinity place.

The Wright Rich Cut Glass Company is enlarging its factory at Anderson, Ind.

Bedford, Ohio, will vote on issuance of $45,000 bonds for water and sewer system.

The plant of the Puritan Soap Company, Rochester, N. Y., was burned. Loss, $30,000.

The Harmony Mills, Cohoes, N. Y., will install a 3000-kilowatt central power station.

Simon & Stewart have commenced the construction of a power plant at Cornell, Wis.

A. G. Balgerach has started work on a $25,000 creamery plant at New Egypt, N. J.

The sawmill of William G. Potts, of Busleton, Penn., was destroyed by fire. Loss, $12,000.

Hudson River Paper Company, Cohoes, N. Y., will shortly build an addition to its plant.

Fire destroyed the carriage works of Wetherholdt Brothers, at Reading, Penn. Loss, $30,000.

Fire destroyed the sash and blind factory of Theodore Schulz, Pacific avenue, Jersey City, N. J.

The Baltimore & Ohio Railroad, at Warwick, Ohio, had a coal tipple ruined by fire. Loss, $65,000.

The Northwestern Can Company's plant, at 330 Orleans street, Chicago, Ill., was burned. Loss, $100,000.

East Palestine Pottery Company, East Palestine, O., will add 100-kilowatt generator to present equipment.

The power plant of the Mountain Ice Company, of Stroudsburg, Penn., was destroyed by fire. Loss, $40,000.

The Philadelphia Suburban Gas and Electric Light Company will build a new power plant at Pottstown, Penn.

A loss of $200,000 was entailed by a fire that destroyed the Mayflower mills and elevator at Fort Wayne, Ind.

Fire destroyed the cloth-weaving mill of Cornelius McIlvaine, at 1648 North Sixth street, Philadelphia, Penn.

The city of Cleveland, Ohio, will erect a high-pressure pumping station. Refer to A. B. Lea, public service director.

The Dorschel Produce Company, of Green Bay, Wis., will build another plant and install cold-storage machinery.

The Taggart Baking Company, Indianapolis, Ind., will build at once an addition to its plant to cost about $25,000.

Sherman Paper Box Company, Dayton, Ohio, has been incorporated by Chas. Anderton to manufacture paper boxes.

The Griswald Worsted Company, of Darby, Penn., will make further additions to its steam-turbine-equipped power plant.

The village of Salem, Washington county, N. Y., has granted a franchise to Frank A. Hill to install a waterworks system.

The Philadelphia Coppersmithing Company has let contract for a new factory at 222 to 226 North Front street, Philadelphia, Penn.

The Girard Point elevator plant of the Pennsylvania Railroad, in Philadelphia, is to be rebuilt and equipped with new power plant.

The flour mill of the Mayflower Milling Company, Fort Wayne, Ind., was destroyed by fire, causing a loss of about $150,000. Will be rebuilt.

At Greenspring, Ohio, D. M. Scott has secured a franchise for 25 years to operate an electrical plant to furnish current for light and power.

Electrical equipment will be required for the $150,000 office building to be erected for the Commercial Building Company, of Cleveland, Ohio.

The Philadelphia Tapestry Mills are having an addition built to be used as weaving rooms at Howard and Westmoreland streets, Philadelphia.

The Laird Schober Company, shoe manufacturer, will erect an eight-story factory at Nineteenth and Buttonwood streets, Philadelphia, Penn.

The Penn Cigar Company has purchased a site at Bedford avenue and Shelby street, Pittsburg, Penn., on which it will build a four-story factory.

A permit has been issued to H. E. Graw & Co. to build a boiler and engine house at the corner of Hancock and Turner streets, Philadelphia, Penn.

George Garrett & Sons, carriage and wagon builders, are having a three-story addition built at Twenty-ninth and Spring Garden streets, Philadelphia.

Herrick Brick and Tile Company, Cleveland, Ohio, has been incorporated by F. A. Herrick, H. A. Herrick, etc., for $50,000, to manufacture brick and tiles.

The Tel-Electric Piano Player Company, of New York, has secured the plant formerly occupied by the Alden-Sampson Manufacturing Company, at Pittsfield, Mass.

The Ohio Metal Treatment Company, of Cincinnati, Ohio, has been incorporated for $200,000 to do a metal treating business, by E. J. Babbett, W. T. Judkins, D. Lamon, etc.

The Uhrichsville Ice Company, Uhrichsville, Ohio, has been organized to manufacture and sell ice. Incorporators, F. E. Cooper, George S. Evans, J. E. Groves, etc. Capital, $25,000.

The Syracuse (N. Y.) Rapid Transit Company contemplates, among other extensions and improvements, the building of two additional transformer stations, costing $158,-090.

A new engine and generator will be installed in the new building to be erected on the Newburg State Hospital grounds, Newburg (Cleveland), Ohio. Refer to Supt. C. H. Clark.

The Evansville Independent Telephone Company, Evansville, Ind., has been incorporated with a capital of $25,000, by E. B. Oslage, E. G. Lockyear, H. T. Cooper and P. J. Fischer.

The buildings and grounds of the American Strawboard Company, at Anderson, Ind., have been sold to the Patent Vulvanized Roofing Company, of Chicago, who will start operations at once.

The Stockdale Tile and Brick Company, Carruthers, Ohio, has been incorporated with $10,000 capital to manufacture tile, brick and other clay products by Philip Stockdale, Ralph W. Stockdale, Ralph R. Gillespie, etc.

The East St. Louis Interurban Electric Railway Company has been incorporated to construct a railroad from East St. Louis to Clinton county. Incorporators, J. L. Flannigan, F. W. Kraft, A. E. Meints, etc.

The Chicago & Joliet Railroad Company, Chicago, Ill., has been incorporated to build a railroad from Chicago to Joliet. Capital, $5000. Incorporators, J. R. Blackhall, Joliet; H. K. Crofts, Geo. M. Stevens, of Chicago, etc.

The Aster Paper Company, Skaneateles, N. Y., has been incorporated to manufacture paper and paper pulp. Capital, $50,000. Incorporators, Geo. M. McKee, Wm. A. McKee, of Hinckley; Frank A. Murphy, Skaneateles.

The Indianapolis Envelope Company, Indianapolis, Ind., has been incorporated with a capital of $125,000, by Herman Hoster, W. B. Emerson and H. B. Mahan, to manufacture envelops, paper boxes and paper goods.

The Northern Illinois Industrial Railroad has been incorporated to construct a railroad from North Chicago to Waukegan. Incorporators, C. E. Sayler, S. Schwartz, J. P. Arthur, all of Waukegan, and others. Capital, $50,000.

The Public Service Commission has authorized the Syracure (N. Y.) Lighting Company to issue $456,000 for extending and improving its gas and electric departments. New stations at East Syracure, Manlius and Janesville are among the improvements planned.

A power plant will be erected on the Miami river, at Woodsdale, near Hamilton, Ohio, with a capacity of 20,000,000 kilowatt-hours per annum. Survey and plans have been completed and work of erection will be begun at once. A syndicate composed of A. S. W. White, Detroit; Ralph Aldrich, Detroit, and I. W. Durfee, Chicago, has acquired the site by purchase.

SOUTHERN STATES

Fire destroyed the plant of the Chatham Hosiery Company, Durham, N. C.

Fire destroyed the plant of the Venable Tobacco Company, Durham, N. C.

The city council, Decatur, Ala., has under consideration the question of a municipal electric-light plant.

WEST OF THE MISSISSIPPI

Adolph Gjelhaugh's sawmill at Wabanica, Minn., was burned.

T. K. Petter & Son's sawmill at Rapid City, S. D., was burned.

Charles Orth's wagon works at Corydon, Ia., was destroyed by fire.

The Gem City Market, Mesa, Ariz., will build a new refrigerating plant.

F. J. McEntree, Perris, Cal., is planning to install a new pumping plant.

The Cramer Brothers' sawmill plant, Polson, Mont., was destroyed by fire.

The Mogollon (N. M.) Gold and Copper Company will build a new sawmill.

Webster City, Ia., will erect a new municipal electric light and power plant.

J. C. Roberts, Portland, Ore., is having plans prepared for a new laundry plant.

The council at Henry, S. D., is arranging for the installation of a waterworks system.

The city of Brewster, Wash., is planning for the installation of a waterworks system.

The plant of the Lindsay Mill Company, Seattle, Wash., (lumber) was destroyed by fire.

A. W. Morris, Knights Landing, Cal., contemplates the installation of a new pumping plant.

The Albert Lea (Minn.) Hide and Fur Company is contemplating the erection of a tannery.

The Pilot Butte Mining Company, of Butte, Mont., will install a hoist and battery of boilers, etc.

The city of Pendleton, Ore., has voted for $200,000 for the construction of a waterworks system.

The One Hundred Barrel Flouring Mill, Lyle, Ore., has acquired a site and will build a new plant.

The Carstens Packing Company, Pasco, Wash., is contemplating the erection of a packing plant.

The city of Turlock, Cal., is planning to erect a municipal gas plant. About $50,000 will be expended.

The city council, Newton, Iowa, has decided to erect a new municipal electric-light and power plant.

It is proposed to grant a franchise to A. Winkler at Fort Pierre, S. D., to install an electric-light plant.

J. C. Colman, Clarksford, Idaho, is planning to install a new waterworks system to serve this section.

The American Fire Brick Company, Spokane, Wash., is having plans prepared for a new building.

The Walther Lumber Company, Spokane, Wash., contemplates the erection of a sawmill near Ellensburg.

The Cantara (Cal.) Box Factory will remove its plant to Dorris, Cal. The new plant will be fully equipped.

Harvey & Regan, Oakesdale, Wash., will build a factory for the manufacture of wagons and carriages.

The United States Laundry Company, San Jose, Cal., has taken out a permit to build a new laundry plant.

Paul & Adams, of Centerville, Ia., will install improvements in the electric-light plant at Fairfield, Ia.

The Newman (Cal.) Waterworks Company contemplates extensions and improvements in its plant and system.

C. W. Hill, Redding, Cal., contemplates the erection of a power plant to serve this section on Bear Creek.

The city of Santaquin, Utah, is planning for the installation of a waterworks system. A bond issue will be voted.

The Standard Sash and Door Company, Seattle, Wash., has been organized by P. H. Hillmann and J. F. Carver.

The Producers Fruit Company, Dinuba, Cal., will build a new packing house. Modern equipment will be installed.

The Mutual Telephone Company, Cottonwood, Idaho, is planning to install a plant and system in this section.

The Parker-Bell Lumber Company, Pilchuck, Wash., will make improvements and additions in its power plant.

W. G. Messersmith, Boise, Idaho, has organized a company, and will build a fruit- and vegetable-canning plant.

The Water Users' Association, Orland, Cal., contemplates the installation of an extensive irrigation system in this section.

The Williams Construction Company, of Chicago, is considering the erection of a canning plant at Missoula, Mont.

Alonzo Adams, Virginia City, Nev., has acquired a power site on the Truckee river, and will build a large power plant.

The Los Angeles (Cal.) Lumber Company has purchased property at San Pedro Harbor and will build four new lumber mills.

Carl F. Haas, San Francisco, Cal., has taken out a permit to build a wood-working plant. Modern equipment will be installed.

The Gundlack Tank Company, Bakersfield, Cal., will build a new plumbing shop building. The plant will be fully equipped.

A. E. Hammond, Madras, Ore., is planning for the erection of an electric light and power plant. A franchise has been granted.

The lumber mill plant of the Lindsay Lumber Company, Lake Washington, near Renton, Wash., was destroyed by fire. Loss, $35,000.

The city of Eugene, Ore., is planning for a bond issue of $37,000, to be used in increasing the capacity of its municipal power plant.

The village council granted a franchise to the Eastern Minnesota Power Company to install an electric-light plant at Braham, Minn.

E. H. Irving, San Bernardino, Cal., is planning for the erection of a new shoe and tannery factory. Modern equipment will be installed.

The Lawndale Water Company, Lawndale, near Los Angeles, Cal., is planning to install a new pumping plant, which will be fully equipped.

The plant of the Hood River (Ore.) Milling Company (flour) was completely destroyed by fire. G. J. Gessling is manager of this company.

Jules Kauffman and E. H. Fosdick, Los Angeles, Cal., have organized a company to build a plant for the manufacture of glass insulators.

The Palmer Oil Company, Los Angeles, Cal., will install new pumping engines and equipment at Avila. Five large units will be installed.

The sawmill and plant of the Connell Lumber Company, Winlock, Wash., was destroyed by fire. The plant will be rebuilt on a larger scale.

The Farmers' Educational and Coöperative Union, Hermiston, Ore., is planning to install a telephone system and plants throughout this district.

The Pacific Telephone and Telegraph Company, San Francisco, Cal., is preparing plans for a new exchange building to be erected at Long Beach.

The Western Metropolis National Bank, San Francisco, Cal., has taken out a permit to build a large carpenter shop in connection with its building.

The Payne-Hudson Lumber Company, Salt Lake City, Utah, has been incorporated by A. E. Payne and T. H. Hudson, with a capital stock of $100,000.

The Indian Valley Light and Power Company, Greenville, Cal., will build a new power plant of 25,000 horsepower capacity on the Feather river near Seneca.

The Snow Creek Water Company, Leavenworth, Wash., is planning to install an electric light and power system in this section. A franchise has been asked.

The Brick and Tile Company, Gooding, Idaho, has been incorporated by F. O. McGill. The company will build a plant for the manufacture of its specialties.

The Methow Valley Irrigation Company, Chelan, Wash., will install an irrigation system in this section to cost $250,000. J. M. Ellingsworth is at the head of this company.

W. F. Boardman & Co., San Francisco, Cal., contemplates the erection of a gas plant at Klamath Falls, Ore., to cost $65,000. A franchise has been asked and guarantee posted.

W. F. Holt, El Centro, Cal., is at the head of a company which will build a $25,000 ice plant at Blythe to supply the Palo Varde Valley. A creamery plant will also be erected.

The Brunswicke-Balke-Collender Company, of Chicago, Ill., has asked for bids on a $400,000 plant at Dubuque, Iowa, for the manufacture of billiard tables, bar-room fixtures, etc.

Frank Searl, Salt Lake City, Utah, is planning for the erection of an electric light and power plant at Challis, Idaho. Mr. Searl is connected with the Capital Electric Company, Salt Lake.

The El Monte (Cal.) Light and Water Company has been incorporated by A. F. Snell and I. T. Baker with a capital stock of $25,000. The company will operate in this section.

The Crater Lake Company is planning for the erection of a large electric light and power plant at Crater Lake, near Klamath Falls, Ore. William G. Steel, Portland, Ore., is head of this company.

The Northern California Power Company, Millville, Cal., is plannnig for the erection of an auxiliary power plant on Cow Creek. The capacity of the other plants of the company will be increased.

Power-plant equipment will be required in the new building to be erected by the Woodmen of the World, Spokane, Wash. Estimated cost $300,000. Plans will be prepared by Frank Clapp, architect, Spokane.

The Portland (Ore.) Cement Company has purchased property in the Kane's Creek district and will build a new cement plant of initial capacity of 400 barrels daily. Aman Moore is head of this company.

Power-plant equipment will be required in the new office building to be erected by the Bankers' Investment Company, San Francisco, Cal. Estimated cost $400,000. Frederick H. Meyer, architect, San Francisco.

The Pacific States Electric Company, Portland, Ore., has purchased the electric-light plant of H. W. Fellows, at Goldendale, Wash. The new owners will make improvements and extensions in the plant and system.

The El Segundo Land and Improvement Company, Los Angeles, Cal., recently organized, has purchased a large tract of property near Manhattan Beach. An isolated water system and gas plant will be installed.

Power-plant equipment will be required in the new building to be erected by the Mt. Zion Hospital Association, San Francisco, Cal. Estimated cost $200,000. Plans will be prepared by J. E. Kraft & Sons, architects, San Francisco.

The Eureka Ranch Company, Escondido, Cal., is installing a new electric-pumping plant. The company will later build an auxiliary plant which will be equipped with gasolene engines. A. W. Wohlford is interested in this company.

CANADA

Estavan, Sask., will extend its waterworks pumping plant.

North Bay, Ont., will spend $100,000 for new waterworks machinery.

Cardston, Alberta, will install a complete new waterworks pumping plant.

The Preston Car and Coach Company, of Preston, Ont., will double its plant.

The Dominion Flour Mills Company will erect a large mill at Montreal, Que.

The Bain Wagon Works, Woodstock, Ont., will erect a large extension to its plant.

Hensall, Ont., will install a new waterworks pumping plant. R. Bonthron, clerk.

J. C. Wilson & Co., paper manufacturers, will build a large new plant in Montreal.

Halifax, N. S., will spend $100,000 for new waterworks equipment and machinery.

Fire destroyed the carriage factory of Carette & Co., on Dorchester street, Quebec.

E. M. Archibald, of Nictaux Falls, N. S., will build a power plant there costing $100,000.

Moosejaw, Sask., will buy $40,000 worth of new electric-lighting machinery for extensions to its present plant.

Saw, planing and lath mills, of the Rhodes Curry Company, at Little Falls, N. S., were destroyed by fire. Loss, $25,000.

Montreal, Que., is calling for complete equipment pumping machinery, blowers and cranes for a very large new filtration plant.

The city of Prince Albert is calling for tenders for the building of a big electrical power development plant on the North Saskatchewan river.

The Alberta Electric Railway, of Calgary, will commence work at once on a number of new lines and power houses. Several millions will be expended.

Twenty-five thousand dollars worth of machinery destroyed by fire in the lath mills of the Rhodes Curry Company at Amherst, N. S., will be replaced at once.

MINING

The New Era mine, Freeland, Colo., will build a new stamp mill.

The Mandich mine, Brown's Flat, near Tuolumne, Cal., will install new machinery.

The Alaska Treasure Gold Company, Juneau district, Alaska, contemplates the erection of a mill.

The Summit Mining Company, Globe, Ariz., is planning for the erection of a 200-ton milling plant.

The Gold Creek and Island Mountain Mining Company, Gold Creek, Nev., will install a 50-ton mill.

The Mexican Mining Company, Virginia City, Nev., will build a concentrating mill and cyanide plant.

The Treasure Mining and Reduction Company, Mogollon, N. M., will increase the capacity of its mill.

The Old Glory mine, on Silver Creek, near Galice, Ore., contemplates the erection of a new stamp mill.

The Quinn Consolidated Mining Company, operating near Virginia City, Nev., will install new machinery.

The Sappho mine, near Nacozari, Sonora, Mex., contemplates the erection of a milling plant in the near future.

The Majestic Gold and Silver Mining Company, Dixie, Idaho, is planning for the erection of a mill and cyanide plant.

The Arizona Commercial Mining Company, Globe, Ariz., is planning to install new machinery and remodel its smelting plant.

The Mololoa Mining Company, Hostotipaquillo district, Jalisco, Mex., is planning to build a reduction plant in the near future.

The Montana-Illinois Copper Company, Cardwell, Mont., contemplates the erection of a concentrating plant and stamp mill.

The Hazel mine, near Van Horn, Tex., operated by C. A. Culter, of Houston, will build a new smelting plant in the near future.

The Lotawana Mining Company, operating near Wickenburg, Ariz., will be in the market for excavator equipment in the near future.

The White Caps mine, Manhattan, Nev., is planning for the erection of a modern crushing and roasting plant for mill treatment.

The Cochise Gold Mining and Milling Company, operating at Cochise Station, Ariz., contemplates the installation of a cyanide plant.

The Providence Mines and Reduction Company, Socorro, N. M., will build a new cyanide plant. H. R. Brown is the head of this company.

The Hemple Copper Mining Company, Landlock Bay, near Valdez, Alaska, is planning to install two aërial tramways in the near future.

The Seven Troughs Coalition Mines Company, Salt Lake City and Seven Troughs, Utah, is planning for the erection of a cyanide plant.

The Good Luck mine, near Boulder, Colo., will make extensive improvements and additions in its milling plant. New equipment will be installed.

BUSINESS ITEMS

The Carpenter-Kerlin Gear and Machine Company, makers of cut gears, announces the change in its corporate name to Carpenter-Tew Gear Company, and the removal of its factory and office to the Bush Terminal buildings, third floor, factory No. 5, Brooklyn, N. Y.

On June 1, 1911, the Sprague Electric Company will be merged with the General Electric Company, of Schenectady, N. Y. Its business will be conducted under the name, Sprague Electric Works of General Electric Company. The manufacture and sale of the lines of apparatus and supplies heretofore exploited by the Sprague Electric Company will be continued by the Sprague Electric Works of General Electric Company under the same organization, with D. C. Durland as general manager. All correspondence should be sent to the Sprague Electric Works at the same address as in the past, 527 to 531 West Thirty-fourth street, New York.

Trade Catalogs

The Mumford Molding Machine Company, Plainfield, N. J. Loose-leaf catalog. Molding machines. Illustrated.

The William Powell Company, Cincinnati, O. Catalog No. 10. Valves, lubricators, unions, etc. Illustrated, 288 pages, 5½x7½ inches.

Sterling Blower Company, Hartford, Conn. Catalog. Sterling slow-speed, low-power exhausters. Illustrated, 12 pages, 6x9 inches.

Westmacott Gas Furnace Company, Providence, R. I. Catalog D. Annealing, hardening, melting furnaces. Illustrated, 64 pages, 6x9 inches.

Keuffel & Esser Company, 127 Fulton street, New York. Pamphlet. Champion continuous blueprinting machine. Illustrated, 4 pages, 6x8½ inches.

The Q. M. S. Company, Plainfield, N. J. Loose-leaf catalog. Metal-sawing machines, hand-power cranes, jibs, cranes, power hack saws, car-wheel grinding machines, etc. Illustrated.

Forthcoming Meetings

Engineers' Society of Pennsylvania; third annual convention, June 7-10, 1911, State College, Penn. Secretary, Harrisburg, Penn.

American Railway Master Mechanics Association; annual convention, Atlantic City, June 14-16, 1911. J. W. Taylor, secretary, Old Colony building, Chicago, Ill.

Society of Automobile Engineers, midsummer meeting, Dayton, Ohio, June 15, 16 and 17, 1911. C. F. Clarkson, secretary, 1451 Broadway, New York city.

Master Car Builders' Association; annual convention, Atlantic City, June 19-21, 1911. J. W. Taylor, secretary, Old Colony building, Chicago, Ill.

National Gas and Gasolene Engine Trades Association, summer meeting, Detroit, Mich., Hotel Ponchartrain, June 20-23, 1911.

Society for the Promotion of Engineering Education, annual convention, June 27-29, Pittsburg, Penn. H. H. Norris, secretary, Cornell University, Ithaca, N. Y.

American Society for Testing Materials, annual meeting, June 27-30, Atlantic City, N. J. Edgar Warburg, secretary, University of Pennsylvania, Philadelphia, Penn.

National Society for the Promotion of Industrial Education; fifth annual meeting, Cincinnati, Ohio, November 2-4, 1911. R. T. Davis, secretary, 18 West Forty-fourth street, New York city.

American Society of Engineer Draftsmen, regular meeting third Thursday of each month H. F. Sloan, secretary, 116 Nassau street, New York city.

The Institute of Operating Engineers. Regular meeting second Thursday of each month, Engineering Societies building, New York City. M. W. Rice, secretary, 29 West Thirty-ninth street, New York City.

American Society of Mechanical Engineers; monthly meeting second Tuesday. Calvin W. Rice, secretary, 29 West Thirty-ninth street, New York City.

Boston Branch National Metal Trades Association. Monthly meeting on first Wednesday of each month, Young's hotel. D. F. S. Clark, secretary, 141 Milk street, Boston, Mass.

Providence Association of Mechanical Engineers. Monthly meeting fourth Tuesday each month. E. C. Bliss, president, 91 Sabine street, Providence, R. I.

New England Foundrymen's Association; regular meeting second Wednesday of each month, Exchange Club, Boston, Mass. Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass.

Engineers' Society of Western Pennsylvania; monthly meeting third Tuesday. Elmer K. Hiles, secretary, Fulton building, Pittsburg, Penn.

Superintendents' and Foremen's Club of Cleveland; monthly meeting third Saturday. Philip Frankel, secretary, 310 New England building, Cleveland, O.

Western Society of Engineers, Chicago, Ill. Regular meeting first Wednesday evening of each month, excepting July and August. Secretary, J. H. Warder, 1735 Monadnock block, Chicago, Ill.

Philadelphia Foundrymen's Association; meetings first Wednesday of each month, Manufacturers Club, Philadelphia, Penn. Howard Evans, secretary, Pier 45 North, Philadelphia, Penn.

WANTS

Rate 25 cents per line for each insertion. About six words make a line. No advertisements abbreviated. Copy should be sent to reach us not later than Friday noon for ensuing week's issue. Answers addressed to our care, 505 Pearl Street, New York, will be forwarded. Applicants may specify names to which their replies are not to be forwarded, but replies will not be returned. If not forwarded, they will be destroyed without notice. No information given by us regarding any advertiser using box number. Original letters of recommendations or other papers of value should not be inclosed to unknown correspondents. Only bona-fide advertisements inserted under this heading. No advertising accepted from any agency, association or individual charging a fee for "registration," or a commission on wages of successful applicants for situations.

Miscellaneous Wants

Caliper catalog free. E.G.Smith, Columbia, Pa.

Self-setting planes. Vineland, N. J.

Special machinery developed and manufactured. Tompkins Bros. Co., Troy, N. Y.

Lyman's gear chart, 50 cents. Address E. Lyman, 431 Wilder Street, Lowell, Mass.

"Engineering Data." Pay roll tables on June list. Box 788, American Machinist.

We buy or pay royalty for good patented machine or tool. Box 282, Amer. Machinist.

Wanted—Work for screw machines and gear cutter. Box 775, American Machinist.

Light, fine machinery to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

Wanted—What have you to offer for machinery we could build to increase our business. Box AX, American Machinist.

Light and medium weight machinery and duplicate parts built to order; tools, jigs, etc. MacCordy Mfg. Co., Amsterdam, N. Y.

Our machine shop solicits either patented article or small machine or tool to manufacture; royalty or cash. Box 853, Am. Mach.

Punches and dies, jigs and fixtures, light and medium weight machinery, etc., built to order. Taylor-Shantz Co., Rochester, N. Y.

Wanted—Machine and press work; tools, dies, jigs and machines built to order. The G. M. Diehl Machine Works, Wabash, Ind.

Patents. C. L. Parker, Patent Attorney, ex-examiner Patent Office, 990 G St., Washington, D. C. Write for Inventor's Handbook.

Light and medium weight machinery and small parts in quantities; also screw machine and punch press work, tools, jigs, dies and high grade machinery. The Elgin Tool Works, Elgin, Ill.

Large English firm of machine tool importers having showrooms and offices in Great Britain, France, Germany, Italy, India and Japan is wanting good agencies for machine tools of all kinds. Box 189, Amer. Mach.

Consulting inventor, experienced in design of intricate mechanisms, offers services to firms having difficult mechanical or electrical problems to solve; fees contingent on clients' entire satisfaction. Box 936, Amer. Mach.

Patents—An able mechanical engineer will see and protect technical points better; valuable suggestions and assistance in developing inventions. G. M. Sacerdote, M. E., and Reg'd Patent Attorney, 1919 Broadway, New York City.

Manufacturer of telegraph machines, adding machines, taxameters, accurate interchangeable parts, dies and special tools, invites orders for similar special manufacturing. The Universal Telegraphic Company, Successors to the Rowland Telegraphic Company, Baltimore, Md.

A progressive company in the Southwest is seeking agency or selling arrangements with manufacturers of mechanical specialties; have good show room located in one of the largest cities in the section and facilities for introducing and pushing these lines. Box 937, American Machinist.

A large and well known firm in central New England, which has been engaged in the manufacture of special machinery for upwards of forty years, is desirous of taking on some outside lines, its own legitimate line of manufacture being suffering from a depression in business, and in order to keep as many of its employees busy, and its organization as intact as possible during the dull period, we wish to make connections for taking on outside lines of machine work; our plant is a very complete and modern one; our machine tool equipment represents an investment of about $125,000; we have a full line of gear cutters, automatic screw machines, and Jones & Lamson turret lathes, etc.; our capital is ample, and we guarantee to handle in a satisfactory manner any work that may be intrusted to us. Write us your requirements. Address Box 72, Worcester, Mass.

Help Wanted

Classification indicates present address of advertiser, nothing else.

CONNECTICUT

Wanted—First class toolmaker. Address B. L. Co., Norwich, Conn.

Wanted—A good engineer and designer to take charge of drafting room of machine shop in Connecticut; man with experience in shop as well as in office preferred. Send application to "W," Care American Machinist.

INDIANA

Wanted—Foreman for tool room; experienced man on punch, die and forming tools. Apply by letter, giving detail of account of past experience. Box 926, Amer. Machinist.

MASSACHUSETTS

Wanted—A thoroughly competent, reliable man to invest $10,000 to $20,000 in a going manufacturing concern, and become directly interested with his services in the company; this is an unusual opportunity; write us. Box 927, American Machinist.

Capable man to take charge of drafting room of large manufacturing plant; one having experience on special automatic machinery preferred; permanent position with chance for advancement for the right party; state fully, experience on this class of work. Box 919, American Machinist.

Wanted—Man competent to take charge of manufacturing end of one of the best paying lines of machine tools on the market, and invest from $5000 to $15,000 in a sure thing; this proposition will stand the most searching investigation; inquiries solicited and prompt attention given same. Box 928, Am. Mach.

High speed steel demonstrator and salesman wanted by a well known house for a brand of high speed and carbon steels, long established and extensively used; competent man with an acquaintance in Illinois, Wisconsin, Minnesota, Michigan and Iowa preferred; give full particulars, including age and salary expected. "J. B." Amer. Mach.

MICHIGAN

Draftsman wanted; young man preferred, who has had experience in mixing, conveying and elevating machinery. Box 896, American Machinist.

MISSISSIPPI

Wanted as foreman of shop, experienced machinist; must be draftsman and familiar with manufacture and operation of generally used printing presses; give references, experience and salary expected. Panchrome Press Mfg. Co., Corinth, Miss.

MISSOURI

Business manager wanted for a plant now being built in the Middle West for the manufacture of heavy excavating machinery; the plant will be completed this fall, and will employ from 400 to 800 men; it is a branch factory of a large company and the manager will be in general charge and responsible to non-resident officers; a man of large ability, good judgment and energy is required; sound business sense and force will be considered more important than technical training, but a

technical man with administrative experience would be preferred for the position; salary will be proportional to results; a man of mediocre ability could not be permanently retained in the position. Reply to Box 921, AMERICAN MACHINIST.

Production engineer wanted for the above plant; the position advertised for is a new one in this plant and the incumbent will be expected, with a reasonable amount of assistance to organize and run the production departments, do the routing and and planning work, making and keeping promises of shipments, etc.; a technical man with practical experience along these lines will be preferred; a thoroughly practical man is wanted with ability to reasonably adapt himself to the present shop conditions, rather than a man who will attempt to revolutionize the existing conditions in the shop, so as to suit his theories; give references and salary expected. Reply to Box 922, AMER. MACH.

Assistant works manager wanted for a St. Louis plant employing 500 men and growing rapidly; the plant consists of machine, pattern, forge and structural shops, hammering, tempering and grinding departments, grey iron and cast steel foundries, also the usual drawing, engineering and cost departments, all of which are under the works manager's general authority, and his assistant must be capable of ably seconding the manager in these various departments; a man with technical education and practical shop training is required; this position has a very good future for an able, energetic man, but an inefficient man could not hold same; salary will be determined by ability and results; a personal interview will be requested, if an examination of references given are satisfactory. Reply to Box 923, AMER. MACHINIST.

NEW HAMPSHIRE

Wanted—A superintendent for a plant of 150 to 200 men, making small interchangeable work; must be thoroughly uptodate in manufacturing methods, understand piece-work system, and the use of high speed steels; a good organizer and know how to handle men; a good position is open for the right man. Box 854, AMERICAN MACHINIST.

NEW JERSEY

Wanted—Foreman for arc lamp and motor assembling department; state salary and references. Address "Permanent." AMERICAN MACHINIST.

Wanted—Lathe miller and Jones & Lamson machine hands; also men used to filing on small work; steady work for competent men. Box 924, AMERICAN MACHINIST.

Water wheel chief engineer, thoroughly competent designer and constructor to take full charge of latest uptodate Francis turbine wheels and governors; applicant must have extended experience; give full particulars. Box 855, AMERICAN MACHINIST.

NEW YORK

Wanted—First class machinists, familiar with marine work, tool hands and outside men only; good wages. Box 942, AM. MACH.

Wanted—Active salesman for ball-bearing concern; good opportunity with growing business; state experience, age, and salary expected. Box 930, AMERICAN MACHINIST.

Wanted—Lathe, planer, vise and grinder hands, automobile and crank shaft work. P. H. Gill & Sons Forge & Machine Works, Lorraine & Otsego Streets, Brooklyn, N. Y.

Wanted—Machinists wanted, lathe hands, screw machine hands, etc.; steady position, desirable surroundings, good wages, no labor trouble. Apply by letter, giving account of past experience. Maxwell-Briscoe Motor Co., Employment Bureau, Tarrytown, N. Y.

Foreman wanted to take charge of screw-machine department, location New York City; job contains hand and automatic screw machines; steay job to competent man. Box 904, AMERICAN MACHINIST.

Draftsman; a thoroughly competent draftsman, capable of designing original automatic machinery wanted by an engineering office; state experience, references and salary. "Designer," Box 929, AMER. MACH.

Grinder hands wanted; those with experience on automobile crank shafts only and capable of running Norton grinders; steady position; apply by letter giving detailed account of past experience, names of previous employers and wages expected. Maxwell-Briscoe Motor Company, Employment Bureau, Tarrytown, N. Y.

Wanted—By small but progressive and growing factory, now employing 30 operatives, a practical, competent diemaker, who is an accurate and rapid worker; one who understands press and die work, from a sub press to a press of 150 tons pressure, and something of automatic feeds and the various forms of discharging work; 10 hours per day, steady place to steady man who can make good; no boozer wanted; stage age, experience, references and wages required, and say whether you have family, and when you could commence. Address "Diemaker," AMERICAN MACHINIST.

OHIO

Wanted—Assistant chief draftsman; applicant must be thoroughly experienced in machine tool design and preferably in lathe design; in answering, give as complete an account of yourself as possible, to avoid unnecessary correspondence. Box 845, AM. MA.

Wanted—First class machinists, toolmakers, die sinkers, lathe, planer, drill press, screw machine, boring and milling machine operators, wood and metal patternmakers, brass polishers, buffers, finishers, millwrights, hammermen and blacksmiths, who wish to increase their opportunities, to register with the free Employment Department of the National Metal Trades Association, New England Building, Cleveland, Ohio.

PENNSYLVANIA

Foreman tool room; should be experienced on heavy die work, thorough in the handling of help and an uptodate man in every respect; good pay for the right man. Box 905, AMERICAN MACHINIST.

The Monotype School is maintained to train young men to meet the constant demand for operators of our type casting and composing machine; these operators do so well that we receive more applications for places than can be filled; these qualifications carry most weight: Common sense, automatic machinery experience, printing office experience, type foundry experience. Full particulars will be furnished to inquirers who furnish the same information about themselves, and mention this paper. Lanston Monotype Machine Co., Philadelphia.

RHODE ISLAND

Experienced scraper fitters wanted on medium light machinery; near Providence; only replies stating experience and minimum wage will be answered. Box 932, AMERICAN MACHINIST.

Wanted—Fifty tool designers; experienced competent men in the design of jigs, fixtures, punches and dies and other special tools used in the manufacture of high grade machine parts on an interchangeable basis; apply by letter stating age, experience and salary required, as well as the date when you would be able to start if application was accepted. The Taft-Peirce Manufacturing Company, Woonsocket, R. I.

SITUATIONS WANTED

Classification indicates present address of advertiser, nothing else.

CANADA

Mechanical superintendent, broad experience in factory efficiency, executive and a organizer, engaged, would correspond, location immaterial. Box 902, AMER. MACH.

CONNECTICUT

Situation wanted as operator on Acme or Brown & Sharpe automatic screw machines; will make change any time; capable of making tools for same; married man. Box 907, AMERICAN MACHINIST.

Successful superintendent, with broad experience, capable of devising proper methods and necessary tools and appliances for producing quantity with quality at its minimum cost, desires change. Box 908, AMER. MACH.

ILLINOIS

Successful superintendent of machine shops and foundries desires a change. Box 933, AMERICAN MACHINIST.

I have an unusual record—a provable record—for the reduction of cost and the increase of output and I have designed the machinery and tools to accomplish the results; I am now ready for a wider field; if you have such a position open or can create one, I will make my salary dependable upon what I accomplish; wide machine-shop experience East and Middle West. Box 920, AMERICAN MACHINIST.

MASSACHUSETTS

Experienced tool designer desires position with firm requiring high grade work and lots of it; can increase production and reduce costs; salary less than $2500 not considered; at present with automobile company. Box 914, AMERICAN MACHINIST.

MICHIGAN

Situation Wanted—To introduce the premium system as an adjunct to the time and cost. Box 918, AMERICAN MACHINIST.

NEW JERSEY

Assistant to foreman, familiar with machine shop, foundry, patternmaking work and structural shop work, also shop drafting; open for engagement July 1; age 42; references. Box 931, AMER. MACH.

NEW YORK

Responsible position by thorough mechanic, modern shop methods, best references. Box 945, AMERICAN MACHINIST.

Draftsman (28), experienced on light machinery and tool design, moderate wages. Box 940, AMERICAN MACHINIST.

Master mechanic and chief planner desires change; capable man, large job; splendid record. W. J. H., AMER. MACH.

Situation wanted by expert mechanical draftsman in New York city; six years' shop experience. Box 875, AMERICAN MACHINIST.

Young man, 21, as detailer and tracer; year's shop experience at drawing board; high school and two years' technical eduction. Box 938, AMERICAN MACHINIST.

Designer, 29, ten years' experience special machinery, tools, etc., for interchangeable parts, also experimental work, desires responsible position. Box 944, AMER. MACH.

Manufacturing engineer; thoroughly grounded in different phases of light and medium manufacturing on large scale; successful record, with present employers ten years. Box 900, AMERICAN MACHINIST.

Draftsman, young man, expert practical designer for automatic machinery and tools; inventive ability; capable of prosecuting patents, wishes responsible position. Box 909, AMERICAN MACHINIST.

OHIO

Draftsman, 28; three years' factory, 11 years' drawing-office experience on small intricate design, tools and special machinery, at present employed; desires responsible position. Box 899, AMERICAN MACHINIST.

Wanted—Position as works manager or superintendent by one experienced in modern manufacturing and system of management; 14 years in executive positions; a hustler; A-1 mechanic and good manager; salary expected $5000. Box 943, AMER. MACHINIST.

Position wanted as assistant superintendent by technical graduate, age 29; eight years' shop and drawing room experience with well known manufacturers of machine tools and special machinery; competent tool designer; thoroughly familiar with modern methods; executive ability; at present holds responsible position in tool designing department. Box 879, AMERICAN MACHINIST.

A superintendent with 20 years' experience and a factory manager with 15 years' experience, both 35 years old and connected with same company and more than making good, desire a wider field and will make a profitable change; will guarantee to organize and systematize any manufacturing establishment, obtain maximum output at minimum cost; correspondence is invited or a visit to the plant where they are at present employed. Box 925, AMERICAN MACHINIST.

PENNSYLVANIA

Office manager or assistant superintendent; thoroughly conversant with uptodate manufacturing office and cost systems; 12 years' practical experience in plant making fine tools and small parts; seven years in charge of office, stock rooms, time, shipping, receiving, records and factory systems. Box 898, AMERICAN MACHINIST.

FOR SALE

Acme nut tapper, 4 spindle, new, takes ⅝ to 1 inch hexagon or square; cost $350, price $200. J. L. Lucas & Son, Bridgeport, Conn.

For Sale—25x25-inch x 10-foot single belt drive Sellers planer, in excellent condition; price, $500, less than half cost. Box 941, AMERICAN MACHINIST.

For Sale—One second hand Niles 26-inch by 21-foot engine lathe, complete with countershaft and attachments. A quick buyer gets a bargain. The Platt Iron Works Company, Dayton, Ohio.

For Sale—Gear cutters for cutting spur gears up to 2 diametrical pitch, one 48-inch Bultman machine; also one 30-inch same type, for cutting up to 2½ diametrical pitch. Address Northern Engineering Works, Detroit, Mich.

For Sale—One Hendey Norton 14-inch engine lathe with taper attachment, good as new; one Brown & Sharpe No. 2 surface grinder with magnetic chuck and generator, new; one small combination tool and disk grinder; I will sell the above at private sale or arrange to accept executive position as superintendent, tool designer or similar position with sale of tools on easy terms. Box 939, AMERICAN MACHINIST.

Talks With Our Readers

By The Sales Manager

Some time ago we received a letter calling our attention to the advertisement of Myers Diamond & Tool Co., which stated that theirs "are the only ones in which you can inspect the diamond without destroying the tool's usefulness."

The following correspondence ensued:

* * *

April 10, 1911

MYERS DIAMOND & TOOL CO.,
Geneva, Ohio.

Gentlemen:

We inclose herewith an advertisement which is appearing in your space in our paper, and our attention has been called to the fact that it is inaccurate.

If you have handy a catalog of the S. Dessau's Sons you will note that they make an adjustable tool and have done so for 25 years. Will you kindly revise your advertisement accordingly.

We must keep all statements in our advertising columns accurate, and you will agree with us when we say that it never pays an advertiser to depart from the truth in their advertising.

Perhaps you had something else in mind, which our Service Department has misinterpreted by mistake, and if so we would ask you to kindly advise us.

Yours very truly,

AMERICAN MACHINIST,
Mason Britton,
Manager.

Geneva, O., April 28, 1911

HILL PUBLISHING CO.,
505 Pearl St., New York City.

Gentlemen:

From the insulting letter recently received from your Mr. Britton we feel we cannot expect proper service from you and are hereby requested to discontinue the publication of our advertisement with the current month.

We are,

Very truly yours,

MYERS DIAMOND & TOOL CO.,
John B. Myers

May 2, 1911

MYERS DIAMOND & TOOL CO.,
Geneva, Ohio.

Gentlemen:

We have your letter of April 28 and are sorry that you have taken this in the spirit that you do.

Our letter of April 10 was written to you in the hope that it would help you, and at the same time protect our readers.

We supposed your experience with advertising was limited and that you did not appreciate how much harm a misstatement in an advertisement would do you.

You evidently have not been reading the "Talks with the Readers" which appear each week in the AMERICAN MACHINIST. In these Talks we impress on our readers that they can have confidence in the statements of our advertisers, and that we will not permit any trifling with this confidence.

Our letter to you was not intended to hurt you in any way. We thought that simply our calling the matter to your attention would have the desired effect.

We have discontinued your advertisement, as we cannot permit misstatements to appear in our advertising columns.

Yours very truly,

AMERICAN MACHINIST,
Mason Britton,
Manager.

P.S.—We intend to publish this correspondence.

* * *

Only reliable products can be continuously advertised.